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INFORMATION BASIC TO FARM ADJUSTMENTS IN THE ROLLING PLAINS AREA OF TEXAS

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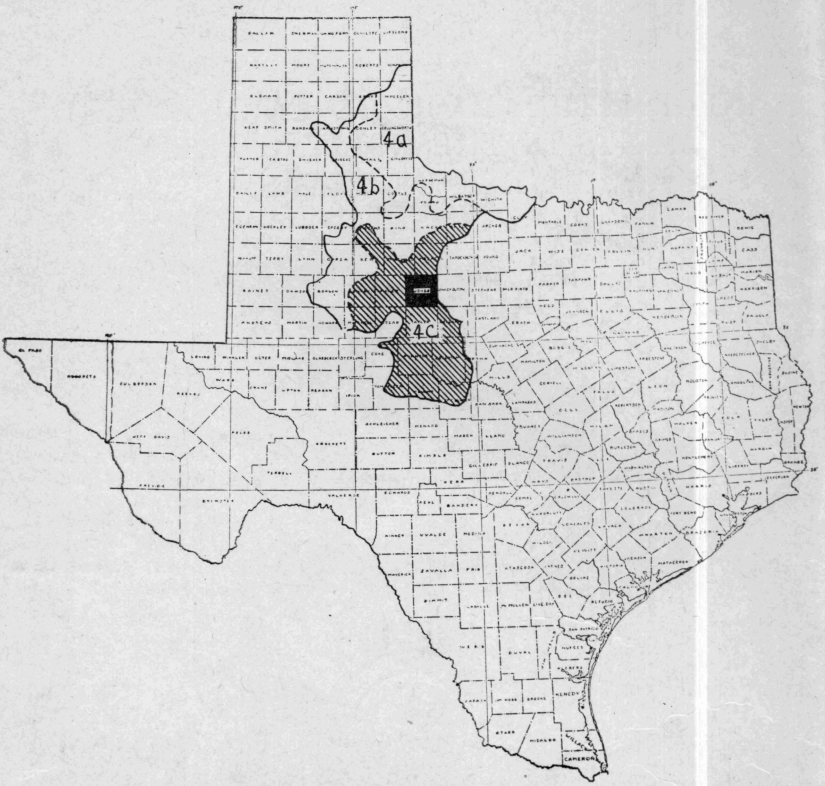

Figure 1. Location and extent of Rolling Plains Area. Area in black indicates county in which study was made. Shaded portion indicates sub-area to which the data are mainly applicable. Area delineation adapted from Texas Agricultural Experiment Station Bulletin No. 544, "A Description of the Agriculture and Type-of-Farming Areas in Texas."

This bulletin reports results of a detailed study of the organization and operation of 200 representative farms in the Rolling Plains Area of Texas. The purpose of the study was to provide basic information which might be used in appraising alternative adjustments in the different sizes of farms and systems of farming found in the area. The data obtained include detailed information pertaining to soils, soil erosion, conservation needs and practices, farm organization, farm income and production, production requirements and production practices for each enterprise. Insofar as possible all these data were related to the major differences in soil types.

An analysis of alternative systems of farming on the heavy dark upland soils resulted in the following conclusions:

1. Increasing the size of farm to utilize more fully operating capital and management, after adjustments required by the AAA program, compares favorably with other alternatives from an income standpoint and more especially so on row crop farms using horse-drawn equipment. This alternative is particularly attractive to farmers of the area for the reason that they make reasonably complete use of their operating capital without the necessity of materially changing their system of farming or having to learn the techniques involved in new enterprises.

2. In cases where additional land cannot be obtained, a system of farming involving more than the usual amount of livestock production is indicated. The choice as between the alternative livestock systems would largely turn on factors other than income since differences in estimated incomes were not so great but that they could easily be offset by improvements in production practices. The dairy and poultry enterprises have some advantage over the feeding of beef cattle in that most farmers already have some knowledge of these enterprises and, furthermore, they lend themselves to gradual expansion as knowledge of improved practices is gained. On the other hand the beef cattle enterprise has the advantage of year-to-year flexibility over dairying. There is a complete turnover in the beef production enterprise each year. This permits an annual adjustment to fit available feed supplies and the price outlook for beef. The beef production system seems to be most advantageous on farms having a cotton-small grain cropping system.

3. Generally speaking, farm income increased with size of farm. The advantage of larger size tends to increase during periods of relatively high prices and is greatly reduced during periods of relatively low prices such as prevailed during the period 1931-1933 and again in 1938. For example, the difference in estimated earnings on row crop farms using one set of one-row horse-drawn machinery between the period of highest prices, 1927-1929, and the period of lowest prices, 1931-1933, was less than $900. The differences as between the same periods were $1,800, $2,500, and $4,500 for row crop farms using one set of two-row horse, two-row tractor, and four-row tractor-drawn machinery.

4. It was estimated that contouring or terracing on the heavy dark land would increase earnings on row crop farms using one set of two-row tractor-drawn equipment by approximately $200 per year assuming average prices of the period 1927-1935. As between the two practices, there was no significant difference except that during periods of high prices terracing would have a slight advantage while during periods of low prices contouring would have the advantage. This probably explains farmer preference for the more simple practice of contouring.

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INFORMATION BASIC TO FARM ADJUSTMENTS IN THE ROLLING PLAINS AREA OF TEXAS[1]

By

P. H. Czarowitz[2] and C. A. Bonnen[3]

The object of this study is to determine the combinations of enterprises and methods of farming best adapted to that portion of the Rolling Plains designated as Type-of-Farming Sub-Area 4c. (See Figure 1.) The basic data for this study were secured by means of a farm management survey of 200 farms in Jones County. Representative farms were selected on the basis of records of the Agricultural Adjustment Administration with the assistance of the county agent and a group of local farmers. The study was made jointly by the Texas Agricultural Experiment Station and the Bureau of Agricultural Economics and the Soil Conservation Service of the United States Department of Agriculture.

The Soil Conservation Service mapped the farms, showing the type of soil, percentage of slope, erosion conditions, and the vegetative cover in 1936. Records of the farm business were obtained for the year 1935 from the farmers cooperating in this study. These records contained details on such items as inventories of land, improvements on land, equipment, feed, seed, livestock, and incidentals. Other items included were records on farm sales and expenditures, quantities and value of farm-raised products used in the home, and the value of unpaid family labor as well as the cash cost of board for hired help.

Detailed information concerning the production of each crop and class of livestock was also secured on selected groups of farms on which the particular crops or classes of livestock were important enterprises. For crops, this information included the operations normally performed, the size and type of machinery used, and the accomplishment per day on the various operations according to the kind of power and size of machines employed. For livestock, data were secured on the amounts of feeds fed, labor requirements, and on other details pertaining to requirements and production.

Conservation needs and practices were studied in connection with 1,200 fields, grouped on the basis of similarity as to soil type, slope, erosion conditions, and vegetative cover. These grouping were based on information contained on the map prepared for each farm by the Soil Conservation Service.

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[1]Acknowledgment is due Harvey Oakes, Ralph L. Schwartz, and Tom C. Reitch of the Soil Conservation Service for the preparation of conservation maps for each of the farms studied. Acknowledgment is also made of the assitance of B. H. Thibodeaux of the Bureau of Agricultural Economics for assistance in planning the study and to A. C. Magee of this Division for assistance in gathering and interpreting the data. C. B. Ray, former employee of the Experiment Station, asssisted in the collection of the data.

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The first part of this study acquaints the reader with conditions in the area by a brief description of its physical characteristics, historical development, and present type of agriculture. Following this, the various types of soils are discussed in terms of their physical characteristics. The importance of climatic conditions as a factor in crop production and in soil and moisture conservation is also discussed.

The systems of farming which prevailed in 1935 are presented in detail. The adaptability of the various enterprises is evaluated with reference to the factors which determine their place in the various systems. In addition, the average earnings in 1935 are presented for the farms studied. The influence of certain factors on farm earnings is evaluated. These include soil type, crop yields, size of farm, and cropping systems.

The normal production and the requirements for labor, power, and seed of each crop are presented in detail. Likewise, the normal production and production requirements of the various classes of livestock are given. Other items considered are farm power, overhead expenses, and prices of products sold and items purchased.

The last section of this bulletin contains the probable effects, as determined by the budget method of analysis, of certain adjustments in the present systems of farming.

The Area Studied[1]

Jones County is representative of Sub-Area 4c, which is a portion of the Rolling Plains, contained within Type-of-Farming Area 4. (See Figure 1.) This portion of the Rolling Plains has a rolling surface with a general slope from west to east. The surface of the area is dissected by numerous streams. The larger streams, namely, the Brazos, Colorado, and Concho rivers rise in areas to the west. These have cut moderately deep valleys with narrow strips of flat alluvial bottomlands. Many small tributaries of these streams reach into all parts of the area and provide rapid drainage. These smaller streams are for the most part dry except immediately following rains. Areas of rough land occur near the larger streams, while the surface of the divides is for the most part gently rolling. The soils and underlying material are readily cut and washed by run-off water. Erosion is slight to moderate over the greater part of the area and is severe only in the more rolling parts. The water supply for farms in the area is secured from the streams and from shallow well water found in most parts of the area.

The native vegetation of Type-of-Farming Sub-Area 4c differs from place to place depending upon the soils and surface conditions. The heavy upland and bottomland soils support a considerable growth of buffalo and grama grasses. On the sandy upland soils the andropogons, grama, and three awn (Aristida) grasses are abundant. Shin-oaks

[1]Area description adapted from Texas Agricultural Experiment Station Bulletin No 431, "The Soils of Texas," by W. T. Carter, Div. Soil Survey.

and sand sage (Artemesia) grow on the very loose sandy soils. Small mesquite trees are distributed over the greater part of the area. Elm, hackberry, oak, and other small trees grow in many of the valleys. Pecan trees are found along some of the streams in the eastern part of the area. The native vegetation is largely typical of sub-humid climatic conditions and no desert plant communities occur.

The average annual temperature of the area is 66 degrees F. in the southern part and decreases to about 62 degrees in the northern part. The area lies within the sub-humid region. Rainfall is irregular and much of it comes in sudden dashing rain storms during the spring and summer. The average annual rainfall is 27 inches in the eastern part of the area and decreases to about 20 inches in the extreme western part. Approximiately two-thirds of the average annual rainfall comes during the growing season from April 1 to October 1, so the rainfall may be expected to be adequate for good yields of the crops grown. The rainfall from one year to another is erratic, however, causing considerable variation in crop yields. It also may be so unevenly distributed during the growing season as to cause a wide difference in yields from one year to another, even though the total rainfall is normal.

Historical Development

Data from the United States Census are used to present a picture of the development of crop production and of the changes in the amounts and proportion of cropland in the different crops in that portion of the area within which the data obtained in this study are considered representative. (See Table 1.) The data cover the period from 1889 to 1939 and pertain to Coleman, Runnels, Taylor, Fisher, Jones, and Haskell Counties, which lie almost entirely within Sub-Area 4c.

This portion of the Rolling Plains was utilized principally for cattle grazing in 1889. Wherever a water supply was available, the abundance of grasses and the protection afforded cattle by the irregularities of the surface relief were features which made possible successful cattle raising. Small grain, cotton, and corn were the principal crops. During the decade from 1889 to 1899, the crop acreage was almost tripled. Cotton likewise increased in importance, and occupied 47.6 per cent of the cropland harvested in 1899. This decade was also marked by the appearance of grain sorghum, principally as a forage crop.

The most significant change in the crops and the crop area occurred in the decade from 1899 to 1909. The area of cropland harvested in 1909 amounted to an increase of 278 per cent over the acreage of 1899. The proportion of cropland in the various crops also changed radically. Cotton occupied 67.2 per cent of the cropland in 1909, and was well established as the principal cash crop. Small grain occupied only 1.2 per cent of the crop area. Corn and other feed crops had been largely replaced by grain sorghum. Both cotton and grain sorghum had proved

Table 1. Acres of crops and proportion of cropland in different crops in Type-of-Farming Area 4c, 1889-1929[1]

Items	1939	1929	1919	1909	1899	1889
Land area (Acres)	3,847,040	3,847,040	3,847,040	3,847,040	3,847,040	3,847,040
Crops harvested (Acres)	1,180,722	1,584,873	1,183,048	881,584	233,346	81,958
Proportion of cropland in various crops:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Cotton	44.2	69.9	45.1	67.2	47.6	24.0
Small grain	8.3	4.6	28.7	1.2	10.5	40.0
Grain sorghums for grain	22.6	14.3	14.3	17.4	.6	----
Corn	2.0	1.3	2.4	4.2	20.4	24.1
Grain sorghums for forage	17.5	8.8	8.6	7.0	13.3	----
Hay crops	1.6	.5	.6	1.8	6.4	11.2
All other crops	3.8	.6	.3	1.2	1.2	.7

[1]Source: U. S. Census.

to be fairly drought-resistant and produced good yields under prevailing conditions.

Crops have retained their relative proportions during the census years since 1909 with the exception of the years 1919 and 1939. In 1919 the cotton acreage decreased to 45.1 per cent of the cropland harvested and small grain increased to 28.7 per cent. That year was one of the exceptional years in which cotton is partially replaced by small grain. It was a year following two successive seasons of drought, and considerable small grain had been seeded in the fall of 1918 on account of a feed shortage. Conditions during the fall and winter were favorable for small grain production, and most of the grain seeded was left for harvesting. Another factor which may have greatly influenced the small grain acreage in the fall of 1918 was the acute labor shortage resulting from war activities. Although 1919 does not present a picture of the most common cropping system in the area, it represents the result of certain price and climatic conditions which have occurred at intervals in the past and may occur in the future.

The small acreage of cotton and the relatively large acreage of grain sorghum in 1939 are logical responses to the program of the Agricultural Adjustment Administration.

Several factors accounted for the rapid development of crop production after 1900. It had become evident that both cotton and grain sorghum were highly drought-resistant and could be grown successfully. It had also been demonstrated that these crops were sufficiently drought-resistant to make them superior to other crops that might be grown. Increased accessibility of markets made possible by the westward extension of the railroads in the decade from 1900 to 1910 was an important contributing factor. The census data show that crop production continued to increase during the decade from 1920 to 1930. The high price of cotton in comparison with the price for beef cattle which prevailed in the period 1923-1925 provided an added stimulus to the shift from cattle ranching to crop production. Since 1925, the shift has been further stimulated by the gradual replacement of workstock with all purpose tractors and one-row horse-drawn equipment with two-row or larger equipment.

Although cattle ranching was the principal source of income early in the development of the area, the number of cattle did not reach its peak until 1900. In that year, the United States Census showed 283,445 head of cattle in the six counties that lie almost entirely within the area. Only 19,041 of these were dairy cows. Since 1900, the total number of cattle has decreased by approximately 50 per cent, but the number of dairy cattle has increased. The factors which prevented a further decline were the replacement of beef cattle by dairy cattle, and the existence of large bodies of rough land which could only be used for grazing.

The rural population in the six counties increased from 21,526 persons in 1890 to 103,225 persons in 1910. In 1920, the rural population was 87,872 persons, which represented a decrease of 14.9 per cent from that of 1910. During this same period, however, improved land in farms increased 6.3 per cent. An important factor contributing to these changes was the extended drought of 1917 and 1918. Undoubtedly, it caused considerable migration from the area and as a consequence the size of the farm unit was increased. Although the rural population increased during the decade 1920-1930 to 100,811 persons, it did not quite attain to that of the decade ending in 1910. Between 1930 and 1940 the rural population decreased 10,974 persons largely in response to reductions in cotton acreage and to a shift from one-row horse-drawn machinery to multi-row tractor-drawn machinery.

Present Agriculture

According to the census report on agriculture for 1939, 93.5 per cent of the total land area of the six counties which are almost entirely within the area was in farms. Of the land in farms, 41.0 per cent was in cropland. Cotton was the most important crop, occupying 44.2 per cent of the harvested cropland. The other major crops were grain sorghum for grain, grain sorghum for forage, and small grain.

The 1930 Census of Agriculture classified each farm as to type of farming on the basis of the relation of a particular source of income to the value of all farm products. For example, if the value of dairy products sold or consumed by the farm family made up 40 per cent or more of the total value of all products, the farm was classified as a dairy farm. On the basis of this classification, 87.4 per cent of the farms in the six counties were classified as cotton farms, 2.8 per cent as stock ranches on which beef cattle was the main enterprise, 2.6 per cent as general farms, six-tenths of one per cent as cash grain farms, and all other types 6.6 per cent. The percentage of the total farm land occupied by each type shows quite a different ratio, because of the large size of the stock ranches. Cotton farms occupied 68.0 per cent of the land in farms, stock ranches 25.4 per cent, general farms 1.8 per cent, cash grain farms four-tenths of one per cent, and all other types 4.4 per cent.

Census data show that the crop acreage in the six counties decreased by 4.6 per cent from 1929 to 1934 and by 10.4 per cent from 1934 to 1939. The low prices received for agricultural products, the severe drought of 1934, and the abandonment of less productive cropland largely account for this decrease. Further changes in the cropland area will depend largely upon price relationships, particularly the relation of prices of cotton to the prices of cattle and dairy products. Expansion of the cropland area is doubtful, however, since most of the better lands are being cultivated at the present time. The acreage of good land that could be devoted to crops may be more than offset by the abandonment of less productive land now in cultivation.

Census reports for the six counties show that 47.4 per cent of the farm operators in 1939 were owners or part owners, 52 per cent were tenants, and six-tenths of one per cent were managers. The bulk of the tenants rent on the so-called third-and-fourth basis. The landlord furnishes the land, residence for the tenant, space for a garden, and facilities for keeping some livestock. The landlord also usually furnishes some native pasture, or the land for a small acreage of sudan pasture, although it is not an uncommon practice for the share tenant to pay cash rent for cropland devoted to sudan pasture. Cash rent is usually paid for ranch land. Third-and-fourth share tenants pay as rent one-fourth of the cotton crop and one-third of other crops. The tenant contributes the labor and management, power and equipment, and seed necessary for crop production. Various cash operating expenses, such as cotton ginning, threshing grain sorghum, and harvesting small grain, are divided between landlord and tenant in the same proportion that the crops are shared. The tenant usually owns all the livestock and receives all livestock products. Share tenants of this type receive little or no supervision from the landlord, and usually do not depend on the landlord for credit. The organization and operation of the farm are similar to those of farms operated by owners; hence the farms operated by these two groups are not treated separately in this study.

Share croppers operated 3.6 per cent of the farms in the six counties during 1939. Croppers usually furnish all the labor and one-half of certain cash operating expenses, principally cotton ginning, and receive in return one-half of the crops. For the purpose of this study, share croppers, as well as laborers receiving crop payment or crop shares, were assigned wages equal to the net proceeds from their crops plus any cash wages received.

PHYSICAL RESOURCES

Soils

Seventeen soil types were identified on the 200 farms mapped by the Soil Conservation Service. For purposes of this analysis these soil types were classed into 5 groups as follows: heavy dark upland soils, heavy reddish upland soils, sandy upland soils, bottomland soils, and shallow broken land. For purposes of comparison, the soils of Jones County, as mapped by the division of Soil Survey, have been similarly classed. The distribution of these soils over the county is shown in Figure 2.[1]

The principal heavy dark upland soils are Abilene silty clay loam and Roscoe clay, comprising 53.6 per cent and 4.5 per cent of the cropland mapped. With these in the heavy dark upland soils group are small

[1]Adapted from "Soil Survey (Reconnaissance) of West-Central Texas" by W. T. Carter and party, Division of Soil Survey, Texas Agri. Exp. Station in cooperation with Bureau of Soils, U. S. D. A., U. S. Govt. Printing Office, 1928. The names of soils given are those used in report of the reconnaissance survey published in 1928 and do not conform in every case to more recent soil correlations as regards to the series names of the soils.

acreages of Abilene silty clay loam—shallow phase and Brackett clay loam which make up only about 1 per cent of the total cropland. The most important soil in the heavy reddish upland soils group is Miles clay loam, which comprises 14.8 per cent of the cropland area. The other heavy reddish upland soils are Vernon clay loam and a small acreage of Miles gravelly clay loam. Almost the entire acreage of sandy upland

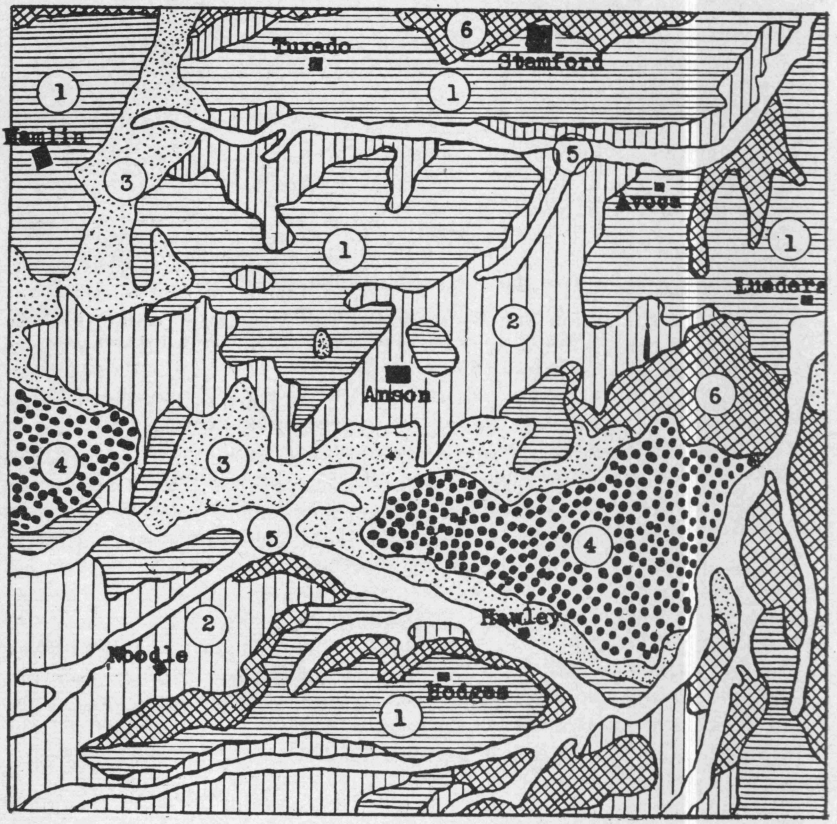

Figure 2. Soils of Jones County. (1) Heavy dark upland soils; (2) Heavy reddish upland soils; (3) Sandy upland soils; (4) Shinnery sand; (5) Bottomland soils; (6) Shallow broken land.

soils consists of Miles fine sandy loam, which occupies 13.2 per cent of the cropland mapped. Included with this soil are small acreages of Miles fine sandy loam—shallow phase and Abilene fine sandy loam which constitute less than 1 per cent of the total cropland area. Miller silty clay loam comprises approximately half of the bottomland soils mapped. The balance of the bottomland soils is comprised of Miller clay loam, Miller fine sandy loam, Spur clay loam, Spur silty clay loam, and Spur fine sandy loam in almost equal proportions. The shallow broken land

consisted largely of Vernon clay, and made up 2.5 per cent of the total cropland. The small areas of Vernon clay which were found on the farms mapped usually were associated with larger areas of the heavy reddish upland soils.

The heavy dark upland soils are the most important soils of Jones County. (See Table 2.) Soils of this group have deep top-soils of clay, clay loam, or silty clay loam which merge into gray or brown subsoils with very little change. The soils and subsoils readily absorb water. The deep heavy clay subsoils and substrata act as a reservoir with the capacity to hold a large amount of water for growing crops. Crops on these soils are fairly resistant to drought, provided a good supply of moisture is stored in the soil and subsoil before the dry season begins. The soils of this group are the most highly desired soils of the county for crop production and are utilized more for crop production than are the other soils. The soils of this group are well suited to the production of cotton, grain sorghum, and small grain, producing high yields of these crops during years of favorable moisture conditions.

The heavy reddish upland soils comprise the second most important group, making up approximately 23 per cent of the total land area of Jones County. A somewhat smaller proportion of these soils are used for crop production as compared with the heavy dark upland soils. The difference may be explained in terms of greater slope which results in decreased productivity growing out of water and soil losses. Since less rainwater is retained on the sloping areas, crops suffer quickly from drought. During years of favorable moisture conditions, however, good crop yields are secured.

The sandy upland soils are closely associated with the heavy reddish upland soils and occupy 10.7 per cent of the total land area of Jones County. These soils have a fine sandy loam top-soil underlain with a heavy clay subsoil, enabling them to absorb and retain moisture readily. They are highly desired for crop production. Crops grown on these soils are resistant to drought, and yields are less erratic than on any of the other soils.

The alluvial soils occupy approximately 9 per cent of the land area in Jones County. These soils are deep, contain considerable organic matter, and range from sandy to clay in texture. As a rule, they are fairly well drained and highly productive. Crops grown on these soils are moderately resistant to drought. As is noted in Table 2, however, only 67.4 per cent of the alluvial soils on the farms mapped was in cropland.

The shallow phase of Miles fine sand, locally known as "shinnery sand," makes up 9.9 per cent of the soils of the county. It consists of a very loose sand varying from one to three feet in depth and underlain with very hard sandy clay. The soil is low in organic matter. Under cultivation, the surface soil drifts considerably and collects in small dunes. This soil occurs in two bodies in the central and western parts

Table 2. Amounts and proportion of total land and cropland in various soils groups in Jones County

Soils	Soils of Jones County[1]		205 farms mapped				
	Acres	Per cent of total	Total acres	Per cent of total	Per cent in cropland	Acres in cropland	Per cent of total
Heavy dark upland soils	209,004	35.4	21,888	56.3	88.6	19,399	59.6
Heavy reddish upland soils	136,196	23.1	7,668	19.7	81.1	6,219	19.1
Sandy upland soils	63,432	10.7	5,216	13.4	85.8	4,476	13.7
Shinnery sand[2]	58,160	9.9	----	----	----	----	----
Shallow broken land	68,017	11.5	1,612	4.2	50.8	819	2.5
Bottomland soils	55,271	9.4	2,480	6.4	67.4	1,671	5.1
Total	590,080	100.0	38,864	100.0	83.8	32,584	100.0

[1]Adapted from: "Soil Survey (Reconnoissance) of West Central Texas" by W. T. Carter and party, Division Soil Survey, Texas Agricultural Experiment Station.
[2]Miles fine sand, shallow phase.

of Jones County. Only a small part is under cultivation and none was found on the farms mapped.

Several bodies of shallow broken land occur in various parts of the county and are used almost exclusively for grazing. These areas, which occupy 11.5 per cent of the land area of Jones County, consist principally of Vernon clay and Abilene clay loam, shallow phase. The top-soil of Vernon clay is a dark chocolate-red, very stiff, dense clay and the parent red beds strata are encountered at depths of from 2 to 5 feet. The top-soil of Abilene clay loam, shallow phase, consists of a very dark brown clay loam and is underlain with caliche in the form of hard and almost pure limestone at depths ranging from 2 to 24 inches.

Of the cropland mapped on the farms studied, 84.7 per cent has less than a 1 per cent slope, and only six-tenths of one per cent has a slope of greater than 4 per cent. (See Table 3.) This would indicate that only the comparatively level areas of the county are utilized for crop production. The bottomland soils and the heavy dark upland soils are the more level, 98.8 per cent and 95.3 per cent, respectively, having a slope of less than 1 per cent. Only 36.1 per cent of the shallow broken land has a slope of less than 1 per cent, as compared to 74.5 per cent for the heavy reddish upland soils and 55.9 per cent for the sandy upland soils.

The erosion conditions on the farms studied are shown in Table 4. Erosion was found to be severe on less than 1 per cent of all of the cropland. Of the remainder, 87.6 per cent was classed as having slight sheet erosion and 8.8 per cent as having moderate sheet erosion. On the heavy dark upland soils, 96.7 per cent of the cropland was mapped as having slight sheet erosion. On the bottomland soils 47.7 per cent was shown as having recent alluvial deposition and 50.8 per cent as having slight sheet erosion, making 98.5 per cent not seriously affected by erosion. The most serious erosion conditions, other than on the shallow broken land of which only 44 per cent was not seriously affected by erosion, were found on the heavy reddish and sandy upland soils. Almost 20 per cent of the heavy reddish upland soils were classified as having from moderate to very severe sheet erosion, while 17 per cent of the sandy upland soils fell in these groups. It should be noted that despite somewhat greater slopes, sandy soils were no more seriously affected by erosion than were the heavy reddish soils. This is probably a result of the more rapid absorption of water on the sandy soils as compared to the heavy soils and the consequent smaller amount of run-off water after rains.

An additional indication of erosion is the extent to which the land is gullied. Approximately 8 per cent of all cropland mapped was classed as having occasional gullies and less than three-tenths of one per cent as having frequent gullies. In other words, there were no gullies on over 90 per cent of the cropland mapped. Here again, the shallow broken land and the heavy reddish and sandy upland soils were adversely affected more frequently than were the heavy dark upland and bottomland soils. Gullies were noted on 39 per cent of the shallow broken

Table 3. Slope of cropland on 205 farms in Jones County

Slope	All soils		Heavy dark upland soils		Heavy reddish upland soils		Sandy upland soils		Bottomland soils		Shallow broken land	
Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
Less than 1	27,582.3	84.7	18,504.8	95.3	4,629.9	74.5	2,501.3	55.9	1,650.5	98.8	295.8	36.1
1 to 4	4,792.4	14.7	886.7	4.6	1,548.2	24.9	1,880.5	42.0	20.7	1.2	456.3	55.7
4 and over	209.0	.6	7.7	.1	40.2	.6	93.8	2.1	-------	----	67.3	8.2
Total	32,583.7	100.0	19,399.2	100.0	6,218.3	100.0	4,475.6	100.0	1,671.2	100.0	819.4	100.0

Table 4. Erosion conditions on 205 farms in Jones County[1]

Erosion	All farms		Heavy dark upland soils		Heavy reddish upland soils		Sandy upland soils		Bottomland soils		Shallow broken land	
	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent	Acres	Per cent
Cropland with:												
1. Slight sheet erosion	28,559.2	87.6	18,770.3	96.7	4,987.8	80.2	3,593.1	80.3	848.7	50.8	359.3	43.8
2. Moderate sheet erosion	2,867.4	8.8	597.0	3.1	1,190.6	19.2	737.3	16.5	19.1	1.1	323.4	39.5
3. Severe sheet erosion	81.8	.3	22.9	.1	11.6	.2	14.9	.3	-----	----	32.4	4.0
4. Very severe sheet erosion	128.6	.4	.8	----	8.5	.1	10.3	.2	6.1	.4	102.9	12.5
5. Recent alluvial and colluvial deposition	946.7	2.9	8.2	.1	19.8	.3	120.0[2]	2.7	797.3	47.7	1.4	.2
Total	32,583.7	100.0	19,399.2	100.0	6,218.3	100.0	4,475.6	100.0	1,671.2	100.0	819.4	100.0

[1]Erosion terms as defined by the Soil Conservation Service.
1. Slight sheet erosion—less than 25 per cent of "A" horizon removed.
2. Moderate sheet erosion—25 to 75 per cent of "A" horizon removed.
3. Severe sheet erosion—over 75 per cent or all of "A" horizon removed and erosion of Upper "B" horizon.
4. Very severe sheet erosion—erosion of lower "B" horizon and the "C" horizon.

[2]Includes wind deposition.

land, on 13.2 per cent of all heavy reddish soils, and on 18.2 per cent of all sandy upland soils. In contrast, gullies appeared on only slightly more than 3 per cent of both heavy dark upland and bottomland soils.

There is a definite positive relationship between the percentage of slope and the frequency of gullies. Gullies were reported on only 4.5 per cent of the cropland having slopes of less than 1 per cent, whereas gullies were noted on 27.6 per cent and on 63 per cent of the lands having slopes of 1 to 4 per cent and 4 per cent and over, respectively.

Apparently the conditions which result in sheet erosion are also conducive to the formation of gullies. Gullies were noted on only 5.5 per cent of the land classed as having slight sheet erosion and on 40 per cent of the land classed as having moderate sheet erosion. The acreage of cropland classed as having severe sheet erosion was insufficient for further comparisons on this basis.

Climatic Conditions

The amount and distribution of rainfall are two of the most important factors affecting crop production. The annual rainfall averages slightly more than 24 inches, a sufficient amount, when well distributed, for good yields of the crops usually grown. (See Table 5.)[1] Timeliness of rainfall also has an important influence on crop yields. Approximately two-thirds of the normal rainfall comes during the six-month period April 1—September 30.

Table 5. Average monthly and annual rainfall in Jones County

Station	Length of record years	Inches of rainfall											
		Annual	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Abilene	50	24.63	0.89	1.07	1.23	2.63	4.13	2.60	1.87	2.16	2.76	2.60	1.36	1.33
Stamford	15	23.70	0.59	1.47	1 08	2.29	3.80	2.00	1.74	2.43	2.79	2.30	1.45	1.70

Jones County lies within the sub-humid region and rainfall is typical of sub-humid conditions. Rainfall varies considerably from one year to another, and within the year, causing wide fluctuations in yields. At Abilene, the annual rainfall was varied in recent years from 46.43 inches in 1932 to 13.41 inches in 1934. (See Figure 3.) Another such extreme variation was the annual rainfall in 1914 of 41.50 inches as compared to 10.85 inches in 1917. It will be noted that wide variations are common rather than exceptional but are not always as extreme as the two instances mentioned.

The year to year variations in the rainfall during the six-month period April 1—September 30 are relatively greater than the variations in the annual rainfall. Although two-thirds of the rainfall comes during

[1]Rainfall data adapted from "Climatological Data," U. S. Department of Agriculture, Weather Bureau.

the growing season, this proportion has varied from as little as 25 per cent to as much as 84 per cent. The variations in the amount of rainfall during the growing season usually correspond to the variations in the annual rainfall, but this does not always hold true. In 1930, the rainfall was 26.86 inches as compared to 28.26 inches in 1931. In these same years, the rainfall during the growing season was 15.26 inches and 7.12 inches. Other such instances occurred 7 times during the 50-year period.

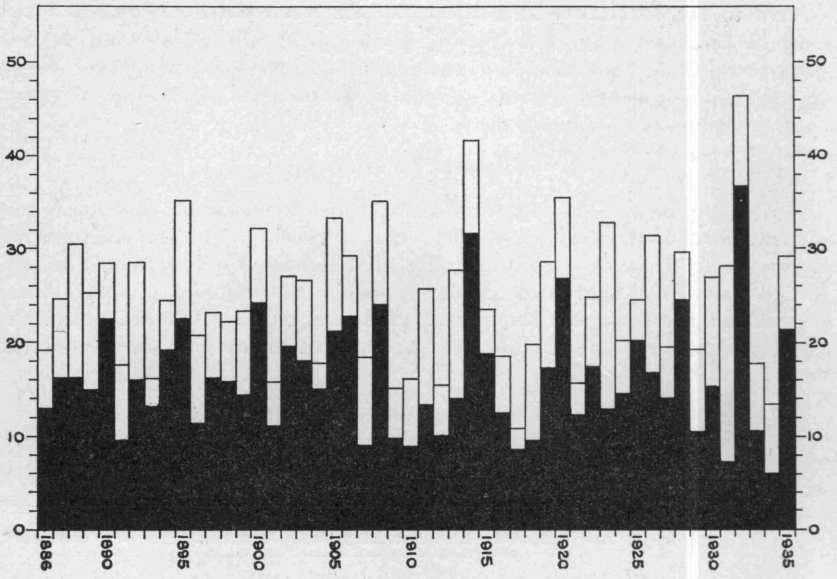

Figure 3. Annual rainfall and rainfall during the six-month period April-September 30 at Abilene, 1886-1935. Height of bar indicates annual rainfall; shaded portion indicates rainfall during period April 1—April 30.

The growing season in Jones County averages 230 days. The extremes have ranged from 202 days in 1907 to 274 days in 1910. Only in occasional years is planting delayed by late frosts, or crops damaged by exceptionally early freezes. Hail frequently damages young crops during the spring months, but the damage is usually local in nature, affecting but few farms. Because of the local nature of hail storms they may have no widespread effect upon farm incomes, but may cause partial or complete crop failures on a few farms. Damage to young crops from wind results through the rapid movement of soil particles and usually occurs only during the spring and early summer when plants are young and tender. Such damage is usually very limited in extent and occurs on a relatively small number of farms on or near the sandy upland soils.

Soil and Moisture Conservation

Farmers in Type-of-Farming Area 4c have recognized that water is the chief limiting factor in crop production. Some interest has been taken in means of obtaining better distribution and more complete utilization of available moisture. Conservation practices such as terracing and contouring partially achieve this aim in retarding the run-off of rain water, allowing a greater portion to sink into the soil. These methods serve a two-fold purpose, since any method which reduces the run-off also decreases the loss of soil through erosion. Erosion is a problem on some of the smoother surfaces and becomes increasingly important on the steeper slopes. On the other hand, terracing and contouring are more effective in moisture conservation on the more level areas. The greater susceptibility of some soils to erosion and loss of moisture through run-off makes soil and moisture conservation important factors in planning the organization and operation of individual farms.

Estimates of the effect of certain conservation practices were secured from the cooperating farmers using these practices. It was estimated that the loss of rainfall was reduced 68 per cent and erosion decreased 69 per cent by terracing. Farmers practicing contouring estimated that it reduced the normal run-off by 41 per cent and decreased erosion 33 per cent. (See Table 6.) In this area, contouring is generally practiced

Table 6. Estimated results of conservation practices

Items	Average of all farms	Heavy dark upland	Heavy reddish upland	Sandy upland soils	Bottom-land soils
Terraced cropland:					
Number of farms in sample	20	13	2	5	--
	Per cent	Per cent	Per cent	Per cent	Per cent
Decrease in erosion	69.2	67.5	78.3	67.5	----
Decrease in run-off water	68.1	65.8	75.0	71.2	----
Contoured cropland:					
Number of farms in sample	86	66	11	7	2
	Per cent	Per cent	Per cent	Per cent	Per cent
Decrease in erosion	33.4	36.6	29.4	33.1	28.3
Decrease in run-off water	41.0	43.8	32.5	39.0	31.7
Increase in time to produce crops	9.0	8.8	10.2	11.4	3.3

on land which has very little slope and tends to have less run-off than land which may require terracing. Contouring and terracing were estimated to increase the time required for operations involving power and machinery by 9 per cent. The time required for harvesting would be increased only to the extent that yields are increased.

Of the 30,445 acres of cropland on the farms studied, 10.9 per cent was reported as terraced and 43 per cent as contoured. (See Table 7.)

The operators of these same farms estimated that 40.6 per cent of the cropland should be terraced and 35.1 per cent should be contoured. It will be noted that although these recommendations call for a great increase in the amount of terracing, they call for less contouring than is now practiced. Fourteen and six-tenths per cent of the total cropland, however, was recommended for terracing that is contoured at the present time. The influence of the slope and present erosion conditions is evident in that terraces were recommended for 57.1 per cent of the cropland on the heavy reddish upland farms and only 26.7 per cent on the bottomland farms. More contouring was recommended for farms on the heavy dark upland soils than for any other. This may have been partly due to the fact that the comparatively level topography of these soils results in a better response to contouring than on soils with greater slope.

Table 7. Summary of conservation practices

Items	Average of all farms	Heavy dark upland	Heavy reddish upland	Sandy upland soils	Bottomland soils
Number of farms in sample	194	120	34	29	11
Total acres in sample	37,284	23,114	7,736	4,539	1,895
Total crop acres	30,445	19,517	5,643	3,727	1,558
Total acres pasture	5,867	3,067	1,835	675	290
Total acres other	972	530	258	137	47
	Per cent	Per cent	Per cent	Per cent	Per cent
Proportion in various conservation practices:					
Cropland terraced—1936	10.9	12.1	10.3	10.5	----
Needed	40.6	36.0	57.1	45.5	26.7
Pasture needing terracing	3.6	3.1	4.4	5.2	----
Cropland contoured—1936	43.0	54.6	29.5	17.3	8.7
Needed	35.1	45.9	14.1	22.6	7.2
Now contoured but needs terracing	14.6	14.3	22.2	9.1	3.5
Pasture needing contouring	2.2	4.1	----	----	----
Cropland strip-cropped—1936	.9	1.5	----	----	----
Needed	1.6	1.9	2.0	----	----
Manure—1936	.1	.1	.1	.2	----
Needed	2.3	2.7	.5	3.9	----
Green manure—1936	9.8	9.1	11.8	7.6	15.7
Needed	9.0	7.7	11.4	11.8	9.3
Summer cover—1936	4.6	3.8	6.7	4.0	7.3
Needed	1.0	.7	1.4	1.7	1.3
Winter cover—Needed	.5	.2	1.2	1.3	----
Cultivated fallow—1936	.8	.9	1.0	----	----
Needed	2.2	3.3	.6	----	----
Idle—1936	.5	.5	.5	.8	----
Needed	.4	.2	.4	1.8	----

The cooperating farmers were making some effort to maintain and improve soil fertility. There were no significant differences, however, in soil improvement practices between farms located on different soils groups. Crops for green manure were grown on 9.8 per cent of the crop acreage on these farms in 1936. Summer cover crops were grown on 4.6 per cent of the crop acreage. Other soil improvement practices were of minor importance and occurred on less than 1 per cent of the cropland.

In many instances the recommendations for soil improvement practices were for smaller acreages than in 1936. Green manure crops were recommended for 9 per cent of the cropland. The use of barnyard manure and cultivated fallow were recommended for 2.3 per cent and 2.2 per cent of the cropland, respectively. Other practices were considered to be of lesser importance and were recommended for 1 per cent or less of the cropland as a regular practice. In the light of these recommendations, it seems logical to conclude that these farmers did not consider the maintenance of soil fertility a major problem.

PRESENT SYSTEMS OF FARMING

In approaching the question of agricultural adjustments on farms in the area, it is well to first consider the existing sizes and systems of farming as indicated by data obtained from records in the files of the Agricultural Adjustment Administration. These records were first sorted as to the area in which the farm was located, using a soils map of the county as the basis for making this classification. In arriving at the systems of farming, records on the farms in each area were sorted into three groups: (1) farms growing cotton, but not wheat; (2) farms growing both cotton and wheat; and (3) farms growing neither cotton nor wheat. These groups were then subdivided according to the total acreage in the farm. These divisions resulted in the sizes and systems of farming presented in the following tables.

A summary of the information for the more common sizes and types of farms on the heavy dark and heavy reddish upland soils is presented in Table 8. The average size of farm in the area is 192 acres with 90 per cent, or 153 acres, in cropland. The three principal crops; namely, cotton, wheat, and grain sorghum, occupy almost two-thirds of the cropland area. The other crops of importance are sudan grass and forage sorghum, which occupy 16 per cent of the cropland. Almost two-thirds of the farms in the area were classed as cotton farms on the basis of the 1938 cropland organization, while the rest grew both cotton and wheat. From the crop organizations shown in the second and third columns of the table, it will be noted that cotton was the most important crop under both systems of farming. An important difference in the two systems is the much larger proportion of the cropland in grain sorghum on the cotton farms. In addition, the cotton farms had a larger proportion of the cropland in cotton.

The various size groups shown in the table represent 88 per cent of the farms in the area. Farms in the smaller size groups were predominantly cotton farms, while the proportion of farms growing both cotton and wheat increased as the size of farm increased. The differences between the two systems of farming were practically the same regardless of the size of farm. In addition, there were no outstanding differences in the cropland organization on cotton farms between the various size groups. On farms growing both cotton and wheat, there was a slight

Table 8. Organization of the most common sizes and types of farms on heavy dark and heavy reddish upland soils, 1938

Items	All farms	Cotton	Cotton and wheat	Size and type of farm: 60–89 acres		90–119 acres		120–179 acres		180–239 acres		240–299 acres		300–359 acres		360–479 acres	480 acres and over
				Cotton	Cotton	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton and wheat	Cotton and wheat
Total number of farms	926	603	323	68	69	248	96	80	46	39	28	48	41	25	23		
Proportion of total land area (Per cent)	100.0	57.7	42.3	3.0	4.1	21.8	8.4	9.2	5.2	5.7	4.1	8.7	7.4	5.8	8.3		
Total land in farm (Acres)	192	171	233	78	105	156	155	206	202	262	264	324	321	417	639		
Native pasture and farmstead (Acres)	39	35	47	9	15	31	24	42	35	62	44	79	69	102	163		
Cropland (Acres)	153	136	186	69	90	125	131	164	167	200	220	245	252	315	476		
Proportion of cropland in:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent		
Soil depleting crops—																	
Cotton	35.8	39.5	31.1	39.7	41.3	38.9	32.5	39.4	31.6	38.9	31.8	38.7	29.2	36.0	29.9		
Wheat	11.8	--	27.7	--	--	--	25.4	--	30.8	--	25.8	--	29.4	18.9	28.2		
Oats and barley	3.0	2.5	3.5	1.5	2.3	2.6	3.2	2.8	1.7	3.9	1.6	3.1	3.8	5.1	4.0		
Corn	.8	1.0	.6	1.1	1.0	.9	.8	1.1	.6	1.2	.6	1.4	.6	.5	.2		
Grain sorghum	18.9	24.5	11.3	24.9	23.8	24.6	12.5	25.3	11.0	23.2	12.6	23.1	10.9	12.3	10.6		
Miscellaneous	.6	.8	.4	.6	1.0	1.1	.3	.5	.4	.2	.5	.9	.6	.4	--		
Total soil depleting	70.9	68.1	74.6	67.8	69.4	68.1	74.7	69.1	76.1	67.4	72.9	67.2	74.5	73.2	72.9		
Non-depleting crops—																	
Sudan pasture	6.0	6.3	5.6	9.0	7.4	6.6	5.9	5.3	4.8	6.5	6.4	5.2	4.8	5.2	6.5		
Small grain pasture	.6	.6	.7	1.1	.5	.6	.8	.5	.4	1.1	.1	.6	1.1	.3	1.0		
Sudan hay	.4	.4	.4	1.6	.5	.3	.4	.2	.1	.2	.3	.6	.6	.1	.5		
Sweet sorghum hay	9.8	10.9	8.5	11.8	12.9	11.7	8.7	10.0	9.8	13.1	7.2	8.4	7.4	7.5	9.9		
Summer fallow	6.6	7.7	5.0	4.7	4.7	6.8	4.5	9.6	4.3	6.4	8.0	10.9	5.7	7.2	3.4		
Crops left standing or turned	3.8	3.8	3.5	2.3	2.1	3.5	3.4	3.9	2.6	3.3	3.5	5.3	4.3	4.6	4.1		
Miscellaneous	1.9	2.2	1.7	1.7	2.5	2.4	1.6	1.4	1.9	2.0	1.6	1.8	1.6	1.9	1.7		
Total non-depleting	29.1	31.9	25.4	32.2	30.6	31.9	25.3	30.9	23.9	32.6	27.1	32.8	25.5	26.8	27.1		
Soil building practices—																	
Proportion of cropland:																	
Terraced	.7	.6	.8	.7	2.5	.7	.2	--	.3	.2	--	.4	.6	3.7	.4		
Contoured	44.4	47.1	40.7	49.1	52.0	46.9	39.0	46.0	39.9	45.1	49.7	43.8	38.9	39.9	45.0		
Green manure or cover crops	4.9	4.9	5.0	4.0	3.4	4.8	4.9	5.2	5.0	4.7	4.8	4.6	4.3	6.3	5.6		
Summer legumes	.4	.4	.3	.3	1.3	.3	--	.2	--	.4	--	.2	1.0	--	.8		

Protected summer fallow	2.1	2.9	1.2	1.5	1.0	2.3	1.1	3.6	1.5	1.7	.9	4.2	2.7	1.0	.3
Miscellaneous	.1	.1	.2	--	--	.1	--	.2	--	--	--	--	.8	--	--
Special crop allotments—															
Cotton	38.9	40.6	36.2	40.7	40.5	40.4	37.4	41.3	35.6	40.3	36.6	40.5	35.9	38.5	32.9
Wheat	4.0	.9	8.9	.3	.7	.6	6.7	1.4	8.9	2.1	8.0	.8	8.9	7.3	14.3
General	32.3	33.4	30.5	33.7	33.5	33.5	31.1	33.4	31.6	32.7	30.1	33.6	30.4	29.5	30.0
Crop yields—															
Cotton, 1934–1939 ave. (lbs.)	118.8	121.7	113.4	125.7	124.2	120.3	116.2	120.2	109.2	122.6	111.3	119.5	115.6	112.0	113.1
Wheat, 1930–1939 ave. (bu.)	12.4	--	12.4	--	--	--	13.5	--	12.1	--	12.7	--	12.5	12.0	12.2

tendency for the proportion of the cropland in cotton to decrease as the size of farm increased. Contour cultivation is practiced on between 40 and 50 per cent of the cropland in the area.

The average size of farm on the sandy upland soils was 175 acres, which is somewhat smaller than the average size on the heavy upland soils. The acreage of cropland was also smaller and amounted to 78 per cent of the total land in the farms. (See Table 9.) An outstanding difference between the farms in this area and the farms on the heavy upland soils lies in the extent to which certain soil and moisture conservation practices were followed. On the sandy upland soils, contour cultivation and summer fallow were practiced on only about half as much of the cropland as in the case of the heavy upland soils.

The great majority of farms in this area were classed as cotton farms, with only 12 per cent of the farms growing both cotton and wheat. The cropland organization on farms following the different systems of farming were about the same as for these same systems on the heavy upland soils. In the smaller size groups, almost every farm was classed as a cotton farm, while farms growing both cotton and wheat predominated only in the largest size group. This may be explained in part by the variation in soils on the individual farms. Although the farm may be predominantly sandy upland soils, on larger farms land suitable for the production of wheat may be sufficient to justify a considerable wheat acreage. On the other hand, the acreage of wheat may be the result of an effort to operate a larger acreage with the existing power and equipment unit and to avoid hiring additional labor or purchasing larger equipment.

On the bottomland soils (Table 10), farms averaged 196 acres in size with 139 acres, or 70 per cent, in cropland. Almost two-thirds of the farms, representing about 53 per cent of the total land area, were classed as cotton farms and the balance grew both cotton and wheat. The cropland organization on cotton farms was practically the same as that on such farms in the two previously discussed areas. In contrast with the above areas, however, the average acreage of wheat exceeded the average acreage of cotton on farms growing both cotton and wheat. Contour cultivation was practiced on only about one-sixth of the cropland. As in the other areas, the smaller farms were predominantly cotton farms and the proportion of farms growing both cotton and wheat was greater on the larger farms.

On the shallow broken land (Table 11), farms averaged 271 acres in size with only 126 acres, or 47 per cent, in cropland. Almost two-thirds of the farms in this area grew both cotton and wheat and the balance were classed as cotton farms. On the cotton farms, the proportion of cropland in cotton was somewhat smaller and oats were an important crop as compared with similar farms in the areas previously discussed. On the farms growing both cotton and wheat, wheat occupied nearly half of the cropland, while cotton and oats occupied only 13 per cent and 7 per cent, respectively. Soil building practices, as defined by the

Table 9. Organization of the most common sizes and types of farms on sandy upland soils, 1938

Items	All farms	Cotton	Cotton and wheat	60–89 acres	90–119 acres	120–179 acres	180–239 acres	240–299 acres		300–359 acres		360–479 acres		480 acres and over
				Cotton	Cotton	Cotton	Cotton	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton and wheat
Total number of farms	391	345	46	45	50	151	43	18	6	14	6	12	4	4
Proportion of total land area (Per cent)	100.0	82.2	17.8	5.0	7.9	33.8	12.9	6.9	2.4	6.6	2.9	7.4	2.3	5.2
Total land in farm (Acres)	175	163	263	76	108	153	204	262	267	324	330	422	392	889
Native pasture and farmstead (Acres)	38	34	64	9	17	26	40	77	56	85	57	162	60	376
Cropland (Acres)	137	129	199	67	91	127	164	185	211	239	273	260	332	513
Proportion of cropland in:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Soil depleting crops—														
Cotton	38.5	39.8	32.5	40.8	40.9	39.2	40.0	39.7	36.2	40.2	28.8	40.1	35.7	27.4
Wheat	4.1	--	24.1	--	--	--	--	--	20.4	--	25.5	--	23.5	33.1
Oats and barley	1.0	.9	1.6	.3	--	.5	.7	1.0	.8	2.8	1.5	2.9	1.1	3.7
Corn	1.7	1.7	1.2	1.3	1.6	1.8	2.1	1.6	.9	1.7	1.3	1.3	.2	1.1
Grain sorghum	23.8	26.2	12.3	25.7	26.2	26.6	27.5	26.6	8.3	23.5	11.0	23.9	14.0	12.0
Miscellaneous	.7	.6	.7	.7	1.1	.6	.4	.3	.4	1.1	.2	.1	--	2.1
Total soil depleting	69.8	69.2	72.4	68.8	69.8	68.7	70.7	69.2	67.0	69.3	68.3	68.3	74.5	79.4
Non-depleting crops—														
Sudan pasture	7.0	6.7	8.5	7.4	6.7	7.2	6.2	4.9	12.6	7.3	9.2	5.9	3.6	7.8
Small grain pasture	.5	.3	1.6	.3	.1	.3	.6	--	5.6	.3	3.7	--	--	--
Sudan hay	.2	.2	.1	.2	.1	.2	.2	.1	.2	--	.2	.6	--	--
Sweet sorghum hay	10.8	11.5	7.4	12.9	10.9	12.3	10.3	11.3	6.8	12.3	6.8	9.8	6.7	3.8
Summer fallow	3.5	3.4	3.8	2.1	2.7	3.0	3.1	2.7	.6	3.8	5.3	7.7	9.9	1.8
Crops left standing or turned	4.6	4.9	3.2	4.8	5.9	4.1	5.8	7.7	6.5	3.9	5.8	4.2	3.3	--
Miscellaneous	3.6	3.8	3.0	3.5	3.8	4.2	3.1	4.1	.7	3.1	.7	3.5	2.0	7.2
Total non-depleting	30.2	30.8	27.6	31.2	30.2	31.3	29.3	30.8	33.0	30.7	31.7	31.7	25.5	20.6
Soil building practices—														
Proportion of cropland:														
Terraced	1.5	2.7	.6	--	2.5	2.1	1.3	--	--	2.6	--	1.2	--	--
Contoured	23.1	21.9	29.2	17.7	19.5	23.9	23.7	13.9	30.9	27.0	27.4	15.7	1.3	44.7
Green manure or cover crops	6.5	7.1	3.7	7.9	9.3	6.5	5.8	10.8	5.1	8.6	4.4	4.2	3.5	1.2
Summer legumes	.8	.8	.6	.8	1.8	.4	1.9	.1	3.0	1.1	.2	--	--	--
Protected summer fallow	.8	.8	.4	.4	.9	.6	.7	.6	--	2.3	--	1.8	--	--
Miscellaneous	.1	.1	--	--	--	--	--	--	--	--	--	1.8	--	--

Table 9. Organization of the most common sizes and types of farms on sandy upland soils, 1938—Continued

Items	Size and type of farm														
	All farms	Cotton	Cotton and wheat	60–89 acres	90–119 acres	120–179 acres	180–239 acres	240–299 acres		300–359 acres		360–479 acres		480 acres and over
				Cotton	Cotton	Cotton	Cotton	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton	Cotton and wheat	Cotton and wheat
Cotton base	66.9	67.4	64.3	64.3	65.6	68.2	66.7	67.0	68.5	69.0	53.8	67.2	67.2	65.0
General base	31.1	30.5	34.4	33.9	32.5	28.6	30.3	33.0	30.9	33.6	42.1	30.9	28.3	34.6
Special crop allotments:														
Cotton	39.9	40.7	36.1	40.5	41.5	40.5	40.2	40.7	38.4	41.1	32.0	41.5	36.7	34.6
Wheat	1.3	.2	7.0	--	--	.1	--	--	6.8	1.9	8.6	--	7.5	9.6
General	33.7	33.8	32.8	34.3	33.9	34.1	34.2	34.1	31.5	30.9	35.1	33.7	31.1	32.1
Crop yields:														
Cotton, 1934–1939 ave. (lbs.)	126	128	113	120.1	133.1	129.4	128.7	126.9	105.3	123.5	115.7	124.1	114.9	106.3
Wheat, 1930–1939 ave. (bu.)	12	--	12	--	--	--	--	--	10.1	--	14.1	--	11.7	9.1

Table 10. Organization of the most common sizes and types of farms on bottomlands, 1938

Items	Size and type of farm							
	All farms	Cotton	Cotton and wheat	60–89 acres	90–119 acres	120–179 acres	180–239 acres	240–299 acres
				Cotton	Cotton	Cotton	Cotton and wheat	Cotton
Total number of farms	68	43	25	8	6	17	7	5
Proportion of total land area (Per cent)	100	53	47	4.4	4.7	18.9	10.3	9.9
Total land in farm (Acres)	195.7	164.2	250.1	73	103	148	213	264
Native pasture and farmstead (Acres)	56.9	40.1	86.0	7	6	31	43	108
Cropland (Acres)	138.8	124.1	164.1	66	97	117	170	156
Proportion of cropland in:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Soil depleting crops—								
Cotton	32.9	38.2	25.9	38.2	40.2	38.0	30.3	38.6
Wheat	15.9	--	36.6	--	--	--	20.9	--
Oats and barley	2.9	1.9	4.0	4.0	--	.2	.8	--
Corn	1.0	1.3	.7	1.8	2.5	1.1	.9	1.2
Grain sorghum	18.6	24.2	11.4	29.6	24.0	25.5	19.6	22.9
Miscellaneous	.8	.4	1.4	.5	.2	.4	2.9	.4
Total soil depleting	72.1	66.0	80.0	74.1	66.9	65.2	75.4	63.1
Non-depleting crops—								
Sudan pasture	7.5	9.6	4.8	5.9	5.2	13.1	6.8	7.8
Small grain pasture	.3	--	.6	--	--	--	.5	--
Sudan hay	--	--	--	--	--	--	--	--
Sweet sorghum hay	9.1	11.1	6.4	11.3	11.9	12.1	9.8	14.6
Summer fallow	3.7	4.2	2.9	.8	13.1	2.3	2.7	1.2
Crops left standing or turned	3.6	4.4	2.6	3.5	1.1	3.4	2.5	7.5
Miscellaneous	3.7	4.7	2.7	4.4	1.8	3.9	2.3	5.8
Total non-depleting	27.9	34.0	20.0	25.9	33.1	34.8	24.6	36.9
Soil building practices—								
Proportion of cropland:								
Terraced	.4	--	1.0	--	--	--	3.6	--
Contoured	16.0	17.4	14.3	4.5	6.1	18.7	13.6	18.9
Green manure or cover crops	4.5	6.2	2.3	5.3	6.1	7.2	.7	--
Summer legumes	1.6	1.9	1.3	--	--	.3	4.5	11.8
Protected summer fallow	1.1	1.9	.1	--	2.2	1.6	.4	2.4
Miscellaneous	.1	.1	--	1.1	--	--	--	--

Table 10. Organization of the most common sizes and types of farms on bottomlands, 1938—Continued

Items	Size and type of farm							
	All farms	Cotton	Cotton and wheat	60–89 acres	90–119 acres	120–179 acres	180–239 acres	240–299 acres
				Cotton	Cotton	Cotton	Cotton and wheat	Cotton
Cotton base	66.7	74.9	57.2	75.4	70.3	76.7	53.3	70.5
General base	31.6	25.9	38.3	22.1	27.1	27.5	34.9	25.9
Special crop allotments:								
Cotton	37.6	41.2	33.4	40.4	41.0	41.6	35.7	39.8
Wheat	5.3	--	11.4	--	--	--	7.5	--
General	32.5	33.1	31.8	34.1	34.1	31.7	32.8	34.8
Crop yields:								
Cotton, 1934–1939 ave. (lbs.)	119.0	123.6	111.3	127.9	150.0	131.0	113.6	110.9
Wheat, 1930–1939 ave. (bu.)	12.2	--	12.2	--	--	--	10.1	--

Table 11. Organization of the most common sizes and types of farms on shallow broken lands, 1938

Items	Size and type of farm									
	All farms	Cotton	Cotton and wheat	120–179 acres		240–299 acres	300–359 acres	360–479 acres	480 acres and over	
				Cotton	Cotton and wheat	Cotton and wheat	Cotton and wheat	Cotton and wheat	Cotton	Cotton and wheat
Total number of farms	98	34	64	11	22	9	10	5	5	7
Proportion of total land area (Per cent)	100	35.6	64.4	6.1	11.6	8.9	12.2	7.5	17.1	16.8
Total land in farm (Acres)	271.3	278.2	267.7	148	155	264	324	403	910	638
Native pasture and farmstead (Acres)	145.0	170.6	131.4	61	55	124	171	218	662	379
Cropland (Acres)	126.3	107.6	136.3	87	100	140	153	185	248	259
Proportion of cropland in:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Soil depleting crops—										
Cotton	19.1	33.5	13.1	34.0	16.1	11.1	18.1	18.9	28.5	6.5
Wheat	34.5	--	49.0	--	49.9	52.5	40.2	29.2	--	64.9
Oats and barley	9.0	10.1	8.6	5.5	6.5	4.2	12.4	8.3	21.3	6.4
Corn	.6	1.1	.4	.5	.2	.4	.7	.4	1.6	.2
Grain sorghum	14.7	25.0	10.3	30.2	10.7	8.1	10.2	14.2	20.7	8.2
Miscellaneous	.2	.3	.2	.3	.5	--	.1	.2	.1	.1
Total soil depleting	78.1	70.0	81.6	70.5	83.9	76.3	81.7	71.2	72.2	86.3
Non-depleting crops										
Sudan pasture	5.1	5.6	4.9	6.2	3.6	6.5	6.5	10.1	2.9	1.8
Small grain pasture	.2	.3	.1	1.0	.4	.2	--	--	--	--
Sudan hay	.1	--	.2	--	.9	--	--	--	--	--
Sweet sorghum hay	8.6	13.9	6.4	13.9	7.2	4.6	4.5	7.3	12.6	6.1
Summer fallow	3.1	4.2	2.7	4.1	1.4	6.4	1.4	2.9	5.2	3.3
Crops left standing or turned	2.5	2.7	2.2	3.4	1.4	1.8	4.9	2.4	4.4	2.3
Miscellaneous	2.3	3.3	1.9	.9	1.2	4.2	1.0	4.3	2.7	.2
Total non-depleting	21.9	30.0	18.4	29.5	16.1	23.7	18.3	28.8	27.8	13.7
Soil building practices—										
Proportion of cropland:										
Terraced	.4	.9	.1	3.7	--	--	.7	--	--	--
Contoured	15.0	18.8	13.4	30.1	14.6	7.8	20.5	13.8	10.3	5.0
Green manure or cover crops	4.6	6.9	3.7	4.2	1.1	.1	7.7	8.4	10.4	2.9
Summer legumes	.2	.3	.2	.6	--	--	.9	--	--	--
Protected summer fallow	.9	1.6	.7	1.8	--	--	--	1.7	3.3	2.0
Miscellaneous	.1	.3	--	--	--	--	--	--	--	--

Table 11. Organization of the most common sizes and types of farms on shallow broken lands, 1938—Continued

Items	Size and type of farm									
	All farms	Cotton	Cotton and wheat	120–179 acres		240–299 acres	300–359 acres	360–479 acres	480 acres and over	
				Cotton	Cotton and wheat	Cotton and wheat	Cotton and wheat	Cotton and wheat	Cotton	Cotton and wheat
Cotton base	53.0	66.1	47.4	64.3	52.3	53.7	43.4	68.7	67.5	31.5
General base	50.0	33.4	57.0	37.6	51.4	49.4	60.0	59.8	26.1	66.4
Special crop allotments:										
Cotton	34.6	40.7	32.0	42.1	35.4	33.3	35.0	42.4	38.8	17.8
Wheat	8.5	.6	11.9	--	8.0	14.2	7.0	15.6	--	19.7
General	34.1	33.6	34.2	32.7	34.3	29.4	35.8	23.1	35.8	41.4
Crop yields:										
Cotton, 1934–1939 ave. (lbs.)	77.2	81.9	74.2	84.3	71.6	72.6	77.0	80.5	71.2	73.5
Wheat, 1930–1939 ave. (bu.)	12.0	--	12.1	--	11.3	11.3	12.9	13.8	--	12.6

Agricultural Adjustment Administration, consisted principally of contour cultivation, with green manure or cover crops of secondary importance.

The systems of farming on the "shinnery sand" were greatly different from those on any other soil group. (Table 12.) The farms were small in size, averaging 169 acres, of which only 50 per cent was in cropland. Two cropping systems prevailed—cotton and row feed in one case and peanuts and row feed in the other. Three-fourths of the farms were classed as cotton farms, and slightly less than one-third of the cropland on these farms was in cotton. There were practically no small grains grown, but peanuts were an important crop. On farms growing no cotton or wheat, grain sorghum and peanuts were the only crops of importance. In 1938 approximately 10 per cent of the cropland on cotton farms and 14 per cent of the cropland on farms having neither cotton nor wheat remained idle. Practically no contour cultivation was practiced on farms in this area and the only soil building practice carried out to any extent consisted of green manure and cover crops.

Of the farms growing neither cotton nor wheat, 85 per cent were less than 180 acres in size. Only 67 per cent of the cotton farms were less than 180 acres. There were no outstanding differences in the cropland organization of either system as between size groups.

The foregoing discussion has dealt with the different systems of farming found on the various soils groups in Jones County in 1938 based on the cropland organization as indicated by the records of the Agricultural Adjustment Administration. In most cases only two types of cropping systems are represented: (1) cotton and grain sorghum, and (2) cotton, small grain, and grain sorghum. Cotton was usually the most important crop and the cropping system on most farms was built around it. Except on the shallow broken land and "shinnery sand," cotton usually occupied approximately 25 to 40 per cent of the cropland. It is the principal source of income and the greater part of the receipts were derived from cotton.

Grain sorghums are the principal feed crops and are grown for grain and forage. Grain sorghum for grain is the only feed crop which is grown for sale as well as for farm needs. It meets the farm requirements for feed and the sale of the surplus provides a source of cash income. Milo is the principal grain sorghum for grain, chiefly because it produces higher grain yields over a period of years than other grain sorghums which can be grown for this purpose. On the basis of ten-year records of the Texas Agricultural Experiment Station Substation at Spur, Dwarf Yellow milo produced an average of 29.4 bushels of grain per acre, while hegari, Spur feterita, and Texas Blackhul kafir produced 26.8, 23.6, and 20.3 bushels. In addition, milo matures earlier than some of the other varieties. As a result, milo harvesting does not compete with cotton harvesting for the labor supply as much as do the other varieties of grain sorghum. Although the common method of harvesting milo for grain is to remove the head and leave the stalk

Table 12. Organization of the most common sizes and types of farms on shinnery soils, 1938

Items	Size and type of farm											
				30–59 acres		60–89 acres		120–179 acres		180–239 acres	360–479 acres	480 acres and over
	All farms	Cotton	No cotton No wheat	Cotton	No cotton No wheat	Cotton	No cotton No wheat	Cotton	No cotton No wheat	Cotton	Cotton	Cotton
Total number of farms	108	81	27	8	9	17	8	28	6	11	4	5
Proportion of total land area (Per cent)	100	14	86	2.0	1.9	7.2	3.6	22.6	4.4	12.0	9.5	20.2
Total land in farm (Acres)	169.2	192.7	98.5	47	39	78	82	148	133	201	434	749
Native pasture and farmstead (Acres)	84.5	98.3	42.8	11	11	20	41	65	51	72	262	579
Cropland (Acres)	84.7	94.4	55.7	36	28	58	41	83	82	129	173	170
Proportion of cropland in:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Soil depleting crops—												
Cotton	27.0	32.3	--	34.0	--	32.3	--	27.8	--	34.1	30	40.5
Peanuts	9.4	8.2	15.8	6.9	22.5	5.8	20.2	8.5	15.7	8.8	15.4	3.6
Corn	3.4	3.6	2.4	4.0	4.9	4.2	4.3	4.3	.7	4.7	1.2	1.5
Grain sorghum	20.2	19.7	22.9	25.5	16.2	23.3	19.6	19.3	19.2	19.1	14.9	14.6
Miscellaneous	2.8	2.7	3.3	.9	4.3	.6	2.4	1.3	4.1	2.2	2.0	13.0
Total soil depleting	62.8	66.5	44.4	71.3	47.9	66.2	46.7	61.2	39.7	68.9	63.5	73.2
Non depleting crops—												
Sudan pasture	3.0	2.6	4.8	2.3	--	2.9	.7	3.0	3.2	2.1	4.3	1.7
Sweet sorghum hay	7.5	8.3	3.5	9.6	4.4	10.8	--	7.2	1.3	6.3	11.4	7.8
Summer fallow	1.2	.8	3.0	3.2	--	.7	.5	.5	.6	1.3	.4	.6
Crops left standing or turned	7.4	7.4	7.1	5.1	.2	7.9	12.7	12.1	8.9	4.7	6.8	2.8
Miscellaneous[1]	18.1	14.4	37.2	8.5	47.5	11.4	39.4	16.0	46.3	16.7	13.6	15.4
Total non-depleting	37.2	33.5	55.6	28.7	52.1	33.8	53.3	38.8	60.3	31.1	30.7	26.8
Soil building practices—												
Proportion of cropland:												
Contoured	1.9	2.3	--	--	--	1.6	--	.5	--	--	--	--
Green manure or cover crops	12.7	12.9	11.7	6.5	2.0	12.9	14.2	18.0	10.9	10.6	17.9	7.3
Summer legumes	.6	.7	.1	--	--	.2	.4	2.0	--	--	--	--
Special crop allotments:												
Cotton	35.2	38.0	22.3	41.2	32.6	40.4	34.2	35.6	13.7	37.3	39.8	38.7
Wheat	.1	.1	--	--	--	--	--	--	--	.6	--	--
General	41.2	37.7	57.2	37.8	51.7	35.1	42.5	40.0	63.6	38.8	35.3	36.6

[1]Consisted principally of idle land.

standing, during periods of feed shortages, the stalks may be bound for forage.

There was a surplus of grain sorghum for grain in almost every system in 1938. It must be remembered, however, that marketing quotas of the Agricultural Adjustment Administration were in effect in that year. Undoubtedly, a large percentage of the land which was diverted from cotton was planted to grain sorghum. Many of the farms studied would not have grown sufficient feed for their own needs without this additional acreage.

Grain sorghum is practically the only crop which is harvested for forage. Cane and hegari are the principal grain sorghums grown for forage. Grain sorghum for forage is grown exclusively for farm needs, with a small surplus occurring in some instances. This surplus is usually too small, however, to constitute an important source of income.

In those systems in which small grain was grown, the proportion of cropland in cotton and grain sorghum usually was smaller than in the other systems. Although small grains, where grown, were an important source of cash income, in most instances cotton remained the most important source of income. The importance of small grain in the cropping system is dependent on the scarcity of feed, the opportunity for fall planting, and the comparative price relationships of cotton and small grain and of grain sorghum and small grain. As a rule, small grain is found on the thin, heavy textured soils which are relatively better suited for small grains than for cotton.

Although sudan is grown on a relatively small percentage of the cropland, it occupies an important place as a source of feed for livestock during the summer months. The available native pasture is limited on the majority of farms and is supplemented with sudan pasture. Sudan may be bound for forage during periods of feed shortage or harvested for seed when the price of sudan seed is relatively high. These latter uses are not common but are the result of unusual conditions.

Information as to the numbers and types of livestock on farms in the different areas were not available from AAA sources, but on the majority of farms included in the detailed study livestock constituted a minor source of income. A discussion of the place of livestock on the farms of the area will be found in the section dealing with the production and production requirements of livestock.

FARM EARNINGS IN 1935

Additional information pertaining to the nature of farming in Type-of-Farming Area 4c may be obtained from a study of farm earnings. The earnings presented are for the year 1935 when crop yields were approximately 25 per cent higher than the estimated normal yields on the farms studied. Prices on items purchased were approximately the same as for the period 1927-1935, while prices on livestock and livestock products were somewhat below the average of that period. Cotton and

small grain prices were about normal, but feed prices in 1935 were well above the 1927-1935 level. The acreage planted to cotton in 1935 was approximately two-thirds of the acreage normally planted to cotton previous to the establishment of the Agricultural Adjustment Administration.

Influence of Certain Factors on Farm Earnings

Wide variations in income occur among farms in the area studied. These variations are the result of differences in natural resources as well as of differences in efficiency of management. The extent to which the operator is able to increase his farm income depends upon the extent to which he is able to control the important factors affecting income. In a study of the effect of the more important factors on income, the farms were grouped first according to the predominant soils group on each farm. Then the farms on which the heavy dark upland soils comprise at least two-thirds of the cropland were grouped according to the crop yield index, the size of the farm, and percentage of cropland in cotton. This restriction of the analysis to farms within one soils group results in minimizing the effect of differences in natural resources.

Soils

A summary of the year's business on the farms studied, grouped according to the predominant soils group on each farm is presented in Table 13. This permits a comparison of groups of farms on different soils and these in turn with the average for all farms.

Rate earned on investment and labor and management wage are the two measures commonly used to show the relative profitableness of farms. Subtracting the operator's labor valued at current wage rates from the return to capital and operator's labor and management leaves the returns to capital and management. Dividing this return by the average farm inventory gives the average rate earned on investment (no allowance for management). The labor and management wage is obtained by subtracting interest on the average investment at 6 per cent from the return to capital and operator's labor and management. The farms as a whole returned 13 per cent on the average investment or $880 as the labor and management wage. Heavy dark upland farms had the highest rate earned on investment and also the highest labor and management wage. Bottomland farms proved to be the least profitable in 1935.

Total farm sales consist of all sales of farm products plus benefit payments for participation in the 1935 cotton program of the Agricultural Adjustment Administration. Although the amount of sales varied widely on the different soils groups, there were no very significant differences in the percentages of sales derived from the various sources. On the average, 76 per cent of the total sales were derived from the sales of cotton lint and seed and from cotton benefit payments. Other crops

made up only 8 per cent of the total sales. Sales of livestock and livestock products made up 13 per cent of sales, while miscellaneous sales accounted for 2 per cent.

Table 13. Farm business summary by soils groups, 1935

Items	Average of all farms	Heavy dark upland	Heavy reddish upland	Sandy upland soils	Bottomland soils
Number of farms	197	122	34	31	10
	Dollars	Dollars	Dollars	Dollars	Dollars
FARM INVESTMENT—Total	8,743	9,236	8,712	7,049	8,104
Land	6,351	6,703	6,288	5,316	5,480
Improvements (less residence)	633	706	548	390	792
Machinery and equipment	822	899	825	447	1,034
Livestock	646	619	754	651	604
Feed, seed, and supplies	291	309	297	245	194
Investment per acre	45.77	48.87	38.55	43.51	45.27
FARM SALES—Total	2,620	2,840	2,468	1,948	2,532
	Per cent	Per cent	Per cent	Per cent	Per cent
Proportion of sales from:					
Cotton—AAA benefit payments	9.1	8.5	9.6	11.6	9.0
Lint and seed	67.1	66.5	66.1	69.8	71.1
Other crops	8.3	9.3	5.9	6.3	6.6
Poultry and eggs	3.8	3.8	3.0	5.9	1.8
Dairy products	3.3	3.1	5.7	2.2	1.6
Cattle	4.5	5.2	3.0	2.0	5.9
Hogs	.7	.6	1.3	.5	.9
Other livestock	1.1	.6	3.8	.1	1.3
Miscellaneous	2.1	2.4	1.6	1.6	1.8
FARM EXPENSE—Total (Dollars)	1,094	1,148	1,110	789	1,330
Percentage of farm expense for:					
Improvements (less residence)	1.2	1.3	1.0	1.1	1.0
Machinery and equipment	12.8	12.2	16.0	12.2	10.2
Feed purchased	6.2	5.2	8.0	10.2	5.0
Other livestock expense	7.8	8.8	8.6	2.4	5.5
Miscellaneous crop expense	35.6	37.3	31.0	32.2	36.0
Hired labor	29.9	28.9	28.6	33.4	37.8
Taxes	5.5	5.3	5.8	7.3	3.8
Miscellaneous farm expense	1.0	1.0	1.0	1.2	.7
	Dollars	Dollars	Dollars	Dollars	Dollars
Total farm sales	2,620	2,840	2,468	1,948	2,532
Value of products used in home	215	215	218	204	232
GROSS FARM INCOME	2,835	3,055	2,686	2,152	2,764
Gross farm income per acre	14.84	16.16	11.88	13.28	15.44
Total farm expense	1,094	1,148	1,110	789	1,330
Unpaid family labor	132	132	156	86	190
Decrease in inventories	204	212	166	207	232
TOTAL DEDUCTIONS	1,430	1,492	1,432	1,082	1,752
Total deductions per acre	7.49	7.89	6.34	6.68	9.79
Return to capital and operator's labor and management	1,405	1,563	1,254	1,070	1,012
Value of operator's labor	229	225	237	228	257
Return to capital investment	1,176	1,338	1,017	842	755
Rate Earned on Inventory (Per cent)	13.45	14.49	11.67	11.94	9.32
Interest on inventory at 6 per cent	525	554	523	423	486
Labor and Management Wage	880	1,009	731	647	526
Farm sales—Total	2,620	2,840	2,468	1,948	2,532
Farm expense—Total	1,094	1,148	1,110	789	1,330
Cash sales over cash expense	1,526	1,692	1,358	1,159	1,202

Total farm expense consists of all farm expense except expense on the residence. The two main items of expense are hired labor and miscel-

laneous crop expense, which consists of planting seed, cotton ginning, binding, threshing, and rented or hired machinery for making a crop. Bottomland farms, which had the lowest farm earnings in 1935, had the highest farm expense and the highest percentage of expense for hired labor. Sandy upland farms, which had the lowest farm sales, also had the lowest farm expense. It is also interesting to note that there were only slight differences as among soil groups in the relative importance of the various expense items.

Additional information pertaining to the general nature of the farms studied is presented in Table 14 in which an analysis of the farm organization and operation in 1935 is shown. The average size of the farms was 191 acres with 156 acres, or 82 per cent, in cropland. Heavy reddish upland farms had the largest crop acreage with 166 acres per farm as compared to the lowest average of 132 acres for the sandy upland farms. Eighty-five per cent of the total land area was in cropland on the heavy dark upland farms as compared to only 74 per cent on the heavy reddish upland farms.

The second section of Table 14 shows the proportion of the cultivated land in the various crops in 1935. An average of 35 acres per farm, or 22 per cent of the cropland, was contracted to the Agricultural Adjustment Administration. This percentage was essentially the same on all soils groups. Cotton and milo accounted for 46 per cent and 25 per cent of the cropland. Wheat and oats accounted for 12 per cent of the crop acreage. There was very little difference between the different soils groups as to the proportion in the various crops with the exception of the sandy upland soils. The small percentage in small grain on the sandy upland soils was offset by a larger percentage in milo.

The yield per acre of the various crops is shown in the third section of the table. The yield of lint cotton averaged 195 pounds per acre on the farms studied. Heavy dark upland farms had an average yield of 209 pounds per acre as compared to 160 pounds for the heavy reddish upland farms. The per acre yields of milo heads ranged from an average of 1,620 pounds on the heavy dark upland farms to an average of 1,059 pounds on the sandy upland farms. Yields of other crops varied with the soil type, but the highest yields usually were found on the heavy dark upland farms. The crop yield index expresses crop yields on the farm or groups of farms as a percentage of the average crop yields for all farms. From the standpoint of yields, the farms ranked in the following order: heavy dark upland, bottomland, heavy reddish upland, and sandy upland farms with a crop yield index of 107, 105, 85, and 84 per cent.

Some outstanding differences in the organization and operation of the farms studied are brought out in the last section of Table 14. It will be noted that 39 per cent of all farms were operated with tractor power. Tractors were used for power on 46 per cent of the heavy dark upland farms, while only 10 per cent of the sandy upland farms had tractors. The labor cost per cultivated acre represents the cost of all

hired labor plus the value of unpaid family labor and the value of the operator's labor. Labor costs per cultivated acre were practically the same for all soil groups with the exception of the bottomland. Farms on this type of land had a labor cost of $6.42 per cultivated acre as compared to $4.30 for farms on the other types of land. Similarly power and equipment costs per cultivated acre were highest on bottomland farms while there was little difference in average costs as between other soil groups.

Table 14. Analysis of organization and operation of farms by soils groups, 1935

Items	Average of all farms	Heavy dark upland	Heavy reddish upland	Sandy upland soils	Bottomland soils
Number of farms	197	122	34	31	10
Total area per farm (Acres)	191	189	226	162	179
Cultivated area per farm (Acres)	156	160	166	132	148
Per cent of total area (Per cent)	81.7	84.7	73.5	81.5	82.7
Cotton land rented to AAA (Acres)	35	37	39	32	40
Proportion cultivated land in:	Per cent	Per cent	Per cent	Per cent	Per cent
Cotton—Planted	45.8	44.7	48.6	47.2	44.8
Contracted to AAA	22.3	22.4	20.6	24.4	24.5
Milo	24.7	24.2	24.0	29.7	20.6
Hegari	2.3	1.8	1.1	4.7	6.3
Cane	4.9	5.3	5.0	3.7	2.2
Wheat	5.7	7.1	3.5	.8	10.3
Oats	6.2	6.5	7.9	3.1	3.9
Sudan	3.9	4.1	3.4	3.1	5.3
Fallow and idle	2.1	1.7	3.1	2.7	2.3
Unaccounted for	1.6	1.6	1.4	2.6	---
All other crops	2.8	3.0	2.0	2.4	4.3
Yield per acre:					
Cotton lint (lb.)	195	209	160	176	208
Milo heads (lb.)	1,440	1,620	1,160	1,059	1,439
Hegari bundles[1] (lb.)	4,541	4,569	3,199	2,820	8,710
Cane bundles[1] (lb.)	5,039	5,378	4,596	3,996	2,712
Wheat (bu.)	6.9	7.1	5.6	7.6	7.5
Oats[2] (bu.)	27.8	27.0	29.3	35.4	20.0
Sudan pasture (Days)	123	126	118	133	98
Crop yield index (Per cent)	100	107	85	84	105
Cows per farm (Number)	3.8	3.5	5.4	3.2	3.7
Hens per farm (Number)	93.8	98.8	81.4	94.7	73.3
Horses per farm (Number)	4.0	3.8	4.2	4.8	3.8
Cultivated acres per horse:					
All farms (Acres)	39.0	42.1	39.5	27.5	38.9
Farms without tractors (Acres)	26.0	26.0	26.8	25.0	27.0
Farms with tractors (Per cent)	39.1	45.9	41.2	9.7	40.0
Farms with trucks or trailer (Per cent)	60.4	61.5	79.4	41.9	40.0
Labor cost per cultivated acre (Dollars)	4.41	4.30	4.27	4.37	6.42
Power and equipment cost per cultivated acre, all farms (Dollars)	3.64	3.58	3.68	3.69	4.09

[1]Small acreage represented on bottomland farms.
[2]Overflow resulted in complete crop failure on 30 per cent of bottomland acreage.

Crop Yields

The importance of crop yields as a factor affecting farm income may be noted in Table 15 in which the farms studied are divided into three

groups based on differences in the crop yield index. The labor and management wage for the various groups was $684, $1,131, and $1,397. The farms with low crop yields tended to have lower incomes than did the farms with high yields. Likewise, the percentage earned on investment tended to increase with increases in crop yields.

Table 15. Farm business summary, by crop yield index

Items	All farms	Crop yield index:		
		59–94	95–119	120–184
Number of farms	100	32	38	30
	Acres	Acres	Acres	Acres
Total area per farm	190	191	207	167
Cultivated area per farm	162	160	173	150
	Per cent	Per cent	Per cent	Per cent
Proportion of cultivated land in:				
Cotton	45.1	45.7	43.9	46.0
Grain sorghum	31.0	26.1	32.0	35.2
Small grain	13.9	19.7	13.6	8.1
Sudan	4.1	3.1	3.9	5.4
All other	5.9	5.4	6.6	5.3
Crop yield index (Per cent)	108	82	113	143
Yield lint cotton per acre (lbs.)	213	171	204	274
Proportion of sales from:				
Cotton—AAA benefit payments	8.7	10.3	8.5	7.7
Lint and seed	69.0	71.9	64.8	72.0
Other crops	10.0	8.0	11.3	9.9
Livestock and livestock products	10.7	8.4	13.6	8.9
Miscellaneous	1.6	1.4	1.8	1.5
	Dollars	Dollars	Dollars	Dollars
Total farm investment	9,217	8,728	10,249	8,432
Investment per acre	48.51	45.70	49.51	50.49
Farm sales—Total	2,855	2,267	3,049	3,237
Farm expense—Total	1,138	888	1,201	1,324
Cash sales over cash expense	1,717	1,379	1,848	1,913
GROSS FARM INCOME	3,055	2,456	3,236	3,464
Gross farm income per acre	16.08	12.86	15.63	20.74
TOTAL DEDUCTIONS	1,434	1,248	1,490	1,561
Total deductions per acre	7.55	6.53	7.20	9.35
Return to capital and operator's labor and management	1,621	1,208	1,746	1,903
Value of operator's labor	228	195	247	240
Return to capital	1,393	1,013	1,499	1,663
RATE EARNED ON INVESTMENT (Per cent)	15.11	11.61	14.63	19.72
Interest on inventory at 6 per cent	553	524	615	506
Labor and management wage	1,068	684	1,131	1,397
Number of cows per farm	3.3	2.8	3.7	3.3
Number of hens per farm	101.6	69.3	119.7	113.0
Labor cost per cultivated acre	4.35	3.70	4.26	5.21
Power and equipment cost per cultivated acre—all farms	3.40	3.03	3.45	3.79
Farms using tractors (Per cent)	51.0	46.9	55.3	50.0

The average size of the farm in the various groups did not vary widely and the percentage of cropland in cotton was approximately the same in all groups. The only significant difference in the proportion of crop-

land in the various crops was in the percentages in small grain and grain sorghum. A large proportion of cropland in small grain was accompanied by a small proportion of cropland in grain sorghums and by a low yield index.

Size of Farm

A summary of the year's business on the farms studied, grouped on the basis of differences in the total land area in the farm, is presented

Table 16. Farm business summary, by size of farm

Items	Average of all farms	Farms ranging in size from:			
		0–120 acres	121–180 acres	181–260 acres	Over 260 acres
Number of farms	100	17	44	18	21
Total acres per farm	190	95	161	210	311
Cultivated acres per farm	162	82	136	185	261
	Per cent	Per cent	Per cent	Per cent	Per cent
Proportion of cropland in:					
Cotton	45.1	50.0	44.0	44.7	45.3
Grain sorghum	31.0	37.1	33.5	32.5	25.8
Small grain	13.9	3.4	10.5	13.2	20.9
Sudan	4.1	6.1	4.8	3.6	3.0
All other	5.9	3.4	7.2	6.0	5.0
Crop yield index (Per cent)	108	111	114	101	108
Yield lint cotton per acre (Lbs.)	213	239	226	201	200
Proportion of sales from:					
Cotton—AAA benefit payments	8.7	8.1	8.1	9.3	9.1
Lint and seed	69.0	75.0	69.0	69.1	67.3
Other crops	10.0	7.1	8.9	9.9	12.2
Livestock and livestock products	10.7	6.2	11.9	10.6	10.5
Miscellaneous	1.6	3.6	2.1	1.1	.9
	Dollars	Dollars	Dollars	Dollars	Dollars
Total farm investment	9,217	4,282	7,509	10,067	16,062
Investment per acre	48.51	45.07	46.64	47.94	51.65
Farm sales—Total	2,855	1,613	2,499	3,120	4,380
Farm expense—Total	1,138	651	998	1,147	1,816
Cash sales over cash expense	1,717	962	1,501	1,973	2,564
GROSS FARM INCOME	3,055	1,729	2,702	3,354	4,611
Gross farm income per acre	16.08	18.20	16.78	15.97	14.83
TOTAL DEDUCTIONS	1,434	759	1,190	1,603	2,348
Total deductions per acre	7.55	7.99	7.39	7.63	7.55
Return to capital and operator's labor and management	1,621	970	1,512	1,751	2,263
Value of operator's labor	228	204	241	233	217
Return to capital	1,393	766	1,271	1,518	2,046
RATE EARNED ON INVESTMENT (Per cent)	15.11	17.89	16.93	15.08	12.74
Interest on inventory at 6 per cent	553	257	451	604	964
Labor and management wage	1,068	713	1,061	1,147	1,299
Number of cows per farm	3.3	1.4	3.5	4.1	3.8
Number of hens per farm	101.6	66.8	115.7	105.5	96.9
Labor cost per cultivated acre	4.35	5.57	4.42	4.50	3.87
Power and equipment cost per cultivated acre—all farms	3.40	3.86	3.88	3.10	2.99
Farms using tractors (Per cent)	51.0	47.1	50.0	55.6	52.4

in Table 16. In 1935, the farm income increased as the size of the farm increased. The labor and management wage for the various size groups was $713, $1,061, $1,147, and $1,299.

Several factors should be taken into consideration in judging the influence of size of farm on the variations in income. Although the smallest size group had the lowest labor and management wage, it had the highest percentage of cultivated land in cotton and the highest yield per acre. These two factors partially offset the influence of size, as is illustrated by the average income per acre of farms in the various size groups. The gross farm income per acre for farms in the different size groups was $18.20, $16.78, $15.97, $14.83.

A tendency to follow more intensive systems of farming on the small farms is indicated by the greater dependence on row crops particularly cotton and grain sorghums. This is a natural result of relatively limited land resources in relation to available labor and to the greater pressure on the operators of small farms in securing adequate incomes. On the larger farms the operator has the choice of using larger power and equipment units or of devoting a portion of the farm acreage to crops requiring less labor or both. Hence the increasing proportion of small grain in the cropping systems with increased size of farm. Although growing small grain necessitates buying some highly specialized equipment, it competes but very little with row-crops for the labor of the operator. This usually permits him to handle a larger acreage than could be grown in row-crops without buying a larger power and equipment unit or an additional unit of power and equipment and hiring the labor required for its operation. This means not only a more efficient use of the operator's labor and power, but also provides a means of diversification which eliminates a portion of the risk involved in depending on a one-crop system of farming. The efficiency with which the available farm power was used is indicated by the power and equipment cost per cultivated acre. This cost tended to be highest on the smallest farms and to decrease with increases in the size of farms.

Several important conclusions may be drawn from this analysis of the effect of size of farm on farm income. The most important is that a larger farm makes possible a greater net income for the individual farmer. Another conclusion is that many farmers in the area are not making the most efficient use of their available power and equipment. In cases where the farm acreage cannot be increased, it may be possible to change to a power and equipment unit the size of which is better suited to the particular size and type of farm. When the amount of land which a farmer has at his disposal is less than that which he could operate with his available labor and power, he may increase his income by more intensive methods of farming. Since the most common method of intensification in the Rolling Plains Farming Area concerns the kind of crop grown, the effect of the cropping system on variations in income, discussed in the following section, is an important factor to be considered.

Cropping System

Since cotton is the most important crop in the area, the effect of the cropping system on farm income may be measured by the proportion of

cropland in cotton. A summary of the year's business on the farms studied, grouped according to the percentage of cropland in cotton, is presented in Table 17. In 1935, the farm income tended to increase as the percentage of cropland in cotton increased. The labor and management wage on farms having 15 to 39 per cent, 40 to 49 per cent, and 50 to 74 per cent of the cropland in cotton was $841, $1,118, and $1,159.

Table 17. Farm business summary, by percentage of cropland in cotton

Items	All farms	Proportion in cotton		
		15–39 Per cent	40–49 Per cent	50–74 Per cent
Number of farms	100	23	45	32
	Acres	Acres	Acres	Acres
Total area per farm	190	209	190	176
Cultivated area per farm	162	183	161	148
	Per cent	Per cent	Per cent	Per cent
Proportion of cultivated land in:				
Cotton	45.1	34.3	45.0	54.7
Grain sorghum	31.0	27.1	34.2	29.5
Small grain	13.9	25.7	9.8	10.0
Sudan	4.1	5.1	4.7	2.2
All other	5.9	7.8	6.3	3.6
Crop yield index (Per cent)	108	103	112	110
Yield lint cotton per acre (lbs.)	213	201	217	216
Proportion of sales from:				
Cotton—AAA benefit payments	8.7	7.8	9.1	8.7
Lint and seed	69.0	59.2	68.9	76.0
Other crops	10.0	12.7	9.9	8.2
Livestock and livestock products	10.7	18.3	10.2	6.1
Miscellaneous	1.6	2.0	1.9	1.0
	Dollars	Dollars	Dollars	Dollars
Total farm investment	9,217	11,151	8,695	8,561
Investment per acre	48.51	53.35	45.76	48.64
Farm sales—Total	2,855	2,744	2,864	2,924
Farm expense—Total	1,138	1,248	1,087	1,129
Cash sales over cash expense	1,717	1,496	1,777	1,795
GROSS FARM INCOME	3,055	2,922	3,085	3,109
Gross farm income per acre	16.08	13.98	16.24	17.66
TOTAL DEDUCTIONS	1,434	1,412	1,445	1,436
Total deductions per acre	7.55	6.76	7.61	8.16
Return to capital and operator's labor and management	1,621	1,510	1,640	1,673
Value of operator's labor	228	229	240	212
Return to capital	1,393	1,281	1,400	1,461
RATE EARNED ON INVESTMENT (Per cent)	15.11	11.49	16.10	17.07
Interest on inventory at 6 per cent	553	669	522	514
Labor and management wage	1,068	841	1,118	1,159
Number of cows per farm	3.3	3.5	3.6	2.7
Number of hens per farm	101.6	100.9	114.6	83.8
Labor cost per cultivated acre	4.35	3.61	4.49	4.79
Power and equipment cost per cultivated acre—all farms	3.40	3.22	3.49	3.43
Farms using tractors (Per cent)	51.0	47.8	42.2	65.6

Certain factors should be taken into consideration in judging the influence of the cropping system on farm incomes. The most important

of these was the average size of farm in each of the groups. As the percentage of cropland in cotton increased, the size of farm decreased. This factor would tend to make the incomes smaller in the group that had the smallest farm. In this case, however, the influence of size was offset by a greater proportion of the cropland in cotton.

The labor cost per acre also increased with increases in the proportion of cropland in cotton. This is to be expected, since cotton requires more labor per acre than does any other crop. Increasing the percentage of cropland in cotton in order to increase the farm income is a means of intensification which necessitates a greater application of certain factors of production. This is also illustrated in part by the power and equipment cost per acre. This cost was lowest on the farms with the least amount of cotton and the greatest amount of small grain. In the last two groups, in which the percentage of small grain was approximately the same, there was no significant difference in the power and equipment costs. It is important to note, however, that the largest percentage of tractors was found on the farms with the largest percentage of cropland in cotton. This may be due to the ability to cover a greater acreage in a critical period by the use of tractor power. This is of greater importance for cotton than for any other crop because of the relatively short planting season for cotton.

It should be noted that benefit payments for participation in the 1935 cotton program of the Agricultural Adjustment Administration constituted approximately the same proportion of sales in each group. Apparently all groups had about the same degree of participation in the program. This would seem to indicate that the variation in incomes in this instance was not the result of participation in the program of the Agricultural Adjustment Administration.

The foregoing discussion has presented the incomes secured in 1935 on the farms studied. In addition, the influence of certain factors on farm earnings has been discussed. The manner in which these factors operated under the conditions that prevailed has been pointed out. The multiple correlation method was used to determine the relative influence on farm earnings of size of farm, crop yield index, and percentage of cropland in cotton. Only the farms on which heavy dark upland soils constituted more than two-thirds of the cropland were used in this analysis. The three factors mentioned, according to the analysis, accounted for 40 per cent of variation in farm earnings in 1935. The separate determination was as follows:

Crop yields	21 per cent
Acres of cropland	15 per cent
Percentage of cropland in cotton	4 per cent

It must be pointed out that the relative influence on farm earnings of the three factors was determined only for the year 1935. The relative influence of these factors may change from year to year as changes in yields, prices, and price relationships occur.

NORMAL PRODUCTION AND PRODUCTION REQUIREMENTS OF CROPS

A consideration of the normal production and reqiurements of production is important to an understanding of the farm problems of Jones County and the surrounding area. Data include normal yields of the various crops, requirements for seed and materials, hours of man labor, hours of horse and tractor work, kind of equipment used, various operations performed and the seasonal distribution of labor requirements.

Production

The yields normally obtained from the various crops on the different soils are an important factor affecting the farm organization and operation. The normal yield was considered as the average yield which may be expected over a period of years under average farming conditions such as have prevailed in the past. The determination of the normal yields shown in Table 18 was based on each farmer's estimate of normal yields of crops usually grown on each soil type on his farm.

Table 18. Normal yields by soil groups

Items	Average of all soils	Heavy dark upland	Heavy reddish upland	Sandy upland soils	Bottom-land soils
Acres represented	29,194	17,859	6,085	3,783	1,467
Yields:					
Lint cotton (Pounds)	155	157	142	153	189
Milo heads (Pounds)	1,402	1,477	1,136	1,393	1,569
Grain sorghum forage (Pounds)	3,946	4,169	3,575	3,346	2,797[1]
Wheat (Bushels)	10.2	12.0	9.8	10.3[1]	11.8
Oats (Bushels)	30.3	34.9	22.2	38.9[1]	22.5[1]
Corn[1] (Bushels)	18.7	----	20.0	17.6	----
Sudan pasture (Pasture days)	123	126	118	133	98

[1]Small sample represented.

The normal yields of the various crops as affected by conservation practices are important in evaluating the results to be obtained from these practices. The normal yields presented in Table 19 show the effect of conservation practices on yields. The normal yields are shown for the heavy dark upland soils as well as for all soils. In the determination of these yields, fields were grouped according to the conservation practice followed.

Cooperating farmers had previously estimated that terracing increased crop yields by 21 per cent and contouring by 16 per cent. The estimated yields which were secured for the individual fields resulted in somewhat the same proportionate increases, except in the case of cotton. The estimated yield of cotton was only about 8 per cent higher on terraced land and 3 per cent higher on contoured land than on land on which no conservation practice was followed.

It will be noted that estimated normal yields on the dark upland soils respond to terracing and contouring somewhat similarly to the

estimated normal yields on all soils. This may be partly accounted for in the fact that heavy dark upland soils make up slightly more than half of the acreage on which these yields were secured. The relation-

Table 19. Normal yields by conservation practices

Items	All soils			Heavy dark upland soils		
	No practices	Terraced	Contoured	No practices	Terraced	Contoured
Acres represented	13,947	3,663	11,584	6,249	2,449	9,161
Yields:						
Lint cotton (Pounds)	151	163	156	149	164	159
Milo heads (Pounds)	1,309	1,601	1,451	1,363	1,623	1,513
Grain sorghum forage (Pounds)	3,684	4,506	4,084	3,893	4,636	4,321
Wheat (Bushels)	9.7	15.6	11.2	9.6	15.9	11.1
Oats (Bushels)	28.6	35.7	30.8	32.9	40.4	35.2
Corn (Bushels)	18.7	----	----	----	----	----

ships between the yields indicated in this table may be much different on other soil types which may respond quite differently to the use of conservation practices. This fact should be kept in mind in planning for the use of conservation practices on other soils.

Normal Requirements of Seed and Materials

The normal requirements of seed and materials of the various crops commonly grown are presented in Table 20. The normal rate of seed-

Table 20. Normal requirements of seed and materials

Items	Cotton	Milo	Forage sorghum	Wheat	Oats
Number of farms in sample	67	60	52	13	22
Acres per farm in 1935—All farms	71.5	38.3	11.6	8.9	9.2
Normal seed per acre—once over (lbs.)	14.4	1.9	6.5	34.2	33.3
Normal proportion replanted (Per cent)	29.3	6.6	2.5	----	----
Proportion seed purchased in 1935 (Per cent)	17.4	2.2	4.6	13.0	31.6
Normal twine used per acre (Pounds)	----	----	3.2	----[1]	2.9

[1]All wheat was combined.

ing for cotton is slightly less than one-half bushel per acre. Twenty-nine per cent of the cotton acreage is normally replanted. It will be noted that 17.4 per cent of the seed required for all cotton planting was purchased in 1935. The majority of this was pedigreed seed and first year seed from pedigreed cotton. The farmers paid an average

price of $1.61 per bushel for planting seed when the market price of other cotton seed was approximately fifty cents a bushel.

Very little seed is required per acre to plant milo and farmers usually save enough grain for planting seed. The grain usually is removed from forage to furnish the required amount of planting seed for forage sorghums. Farmers usually purchase planting seed for the grain sorghums only when the grain has not been matured or when they wish to change to a different variety.

The normal rate of seeding for wheat and oats is approximately one-half bushel of wheat per acre as compared to one bushel of oats per acre. Only 13 per cent of the planting seed for wheat was purchased in 1935 as compared to 32 per cent of the planting seed for oats.

Labor and Power Requirements

The farms for which crop practice data were obtained were grouped according to the size and type of power and equipment employed in order to eliminate differences in labor requirements caused by different sizes of power and equipment units. These farms were first grouped according to the type of power used. This division separated the farms using horse power from the farms using tractor power. The farms using horse-drawn equipment were divided into two groups—those using one-row equipment and those using two-row equipment. The farms using tractor power also were separated into two groups—those using two-row equipment and those using three and four-row equipment.

Cotton

The amounts of labor and power used in the production of cotton, according to the type of power and size of equipment employed, are presented in Table 21.[1] The operations previous to harvesting are most affected by changes in the size or type of equipment. It usually requires 14.9 hours of man labor per acre, previous to harvesting, on farms using one-row horse-drawn equipment, as compared with 10.5 hours on farms using two-row horse-drawn equipment. Although the use of two-row horse-drawn equipment causes a slight increase in the amount of horse labor, it results in a saving of 30 per cent in the hours of man labor required. A total of 8.8 hours of man labor, previous to harvesting, is required on farms using two-row tractor-drawn equipment, as compared to 7.2 hours on farms using three-row and four-row tractor-drawn equipment.

Hauling and ginning is the only harvesting operation affected by a change in equipment. Farmers with horse-drawn equipment use a wagon and team to haul seed cotton to the gin, while farmers using tractor-drawn equipment rely on a car and trailer. The time requirements for

[1]For individual operations for each size of power and equipment unit, see Tables 11a to 11d in Appendix.

harvesting operations are based on the normal yield of 155 pounds of lint cotton per acre.

Table 21. Labor and power required per acre for the usual operations in growing and harvesting cotton

Operation	Horse-drawn equipment				Tractor-drawn equipment			
	One-row		Two-row		Two-row		Three- and four-row	
	Hours per acre							
	Man	Horse	Man	Horse	Man	Tractor	Man	Tractor
Seed bed preparation	3.08	8.07	1.85	8.24	1.34	1.34	.51	.51
Planting	1.92	3.84	.90	4.53	.70	.70	.39	.39
Machine cultivation	4.48	8.98	2.30	9.08	1.32	1.32	.88	.88
Chop	2.48	----	2.48	----	2.48	----	2.48	----
Hoe	2.90	----	2.90	----	2.90	----	2.90	----
Poison	.08	.08	.08	.08	.06	.03	.06	.03
Total previous to harvest	14.94	20.97	10.51	21.93	8.80	3.39	7.22	1.81
Snap	12.27	----	12.27	----	12.27	----	12.27	----
Pick	2.70	----	2.70	----	2.70	----	2.70	----
Haul and gin	1.34	2.68	1.34	2.68	1.20	1.20[1]	1.20	1.20[1]
Total harvest	16.31	2.68	16.31	2.68	16.17	1.20	16.17	1.20
Total hours per acre	31.25	23.65	26.82	24.61	24.97	4.59	23.39	3.01

[1]Car and trailer.

From one-half to two-thirds of the total labor required in the production of cotton is used in harvesting. Cotton harvesting is done principally with hired labor. In this respect, it differs from the other operations, which usually are performed with family labor except for part of the chopping and hoeing. The extent to which harvesting, chopping, and hoeing are hired depends on the acreage in cotton and the amount of family labor available. Farmers with a small acreage of cotton may harvest the entire crop with family labor, while farmers with larger acreages may hire all the harvesting labor.

Snapping is the most common method of harvesting cotton. Normally, only 12 per cent of the cotton is picked, while 88 per cent is harvested by snapping. Snapping is a faster method of harvesting cotton than picking. In addition, cotton harvesters prefer to snap rather than pick cotton. As a general rule, only the early maturing cotton is picked and all late cotton is snapped, though some early cotton is snapped. Frequently, a part of a bale may be picked and the balance snapped, since it is possible to pick sooner than snap after a period of wet weather.

Milo

The amounts of labor and power used in the production of milo are presented in Table 22.[1] There is less hoeing and cultivating on milo

[1]For individual operations for each size of power and equipment unit, see Tables 12a to 12d in Appendix.

Table 22. Labor and power required per acre for the usual operations in growing and harvesting milo

Operation	Horse-drawn equipment				Tractor-drawn equipment					
	One-row		Two-row		Two-row			Three- and four-row		
	Hours per acre									
	Man	Horse	Man	Horse	Man	Horse	Tractor	Man	Horse	Tractor
Seed bed preparation	2.69	6.59	1.54	7.06	1.08	----	1.08	.48	----	.48
Planting	1.54	3.08	.71	3.51	.55	----	.55	.32	----	.32
Machine cultivation	3.14	6.31	1.62	6.38	.93	----	.93	.61	----	.61
Hoeing	2.64	----	2.64	----	2.64	----	----	2.64	----	----
Total previous to harvest	10.01	15.98	6.51	16.95	5.20	----	2.56	4.05	----	1.41
Head and haul in	4.50	9.00	4.50	9.00	4.50	9.00	----	4.50	9.00	----
Total hours per acre	14.51	24.98	11.01	25.95	9.70	9.00	2.56	8.55	9.00	1.41

than on cotton. Milo is not chopped and the relatively small amount of hand labor makes the differences in labor requirements for the various types of equipment much more pronounced than for cotton. Farms using one-row horse-drawn equipment require 10 hours of man labor per acre, previous to harvesting, as compared to 6.5 hours for farms using two-row horse-drawn equipment. This change in equipment effects a saving of 35 per cent in the man labor per acre previous to harvesting. On farms using two-row tractor-drawn equipment, the man labor used, previous to harvesting, was 5.2 hours per acre as compared to 4 hours for farms using three- and four-row equipment.

The time requirements for harvesting operations are based on the average yield of 1,402 pounds of milo heads per acre. Harvesting requirements are the same for farms with all types of equipment. A wagon and team are used in harvesting milo on the majority of farms in each group. Some tractor operated farms have retained workstock for feed harvesting and miscellaneous farm work which cannot be performed advantageously with a tractor, while others have depended on borrowed teams in performing this work.

Grain Sorghum for Forage

The amounts of labor and power used for grain sorghums for forage, previous to harvesting, are less than the amounts used for milo. (See Table 23.)[2] This is primarily due to the lesser amount of hoeing done. Consequently the difference in the amounts of labor and power used, previous to harvesting, are even more pronounced than in the case of milo. Seven and nine-tenths hours of man labor were used on farms using one-row horse-drawn equipment as compared to 4.6 hours on farms using two-row horse-drawn equipment. Farms having two-row tractor-drawn equipment used 3.7 hours of man labor per acre, previous to harvesting, while farms having three-and four-row equipment used only 2.3 hours per acre.

The amounts of labor used in harvesting grain sorghums for forage are based on an average yield of 3,946 pounds of dry forage per acre. An average of 7.9 hours of labor were used for harvesting grain sorghum for forage as compared with only 4.5 hours used in harvesting milo. The majority of farms in each group follow the same method of harvesting. This consists of binding, shocking, hauling in, and stacking. Binding is done with a one-row binder drawn by three head of workstock. The bundles are shocked entirely by hand, while two men with a wagon and team are used to haul and stack.

[2]For individual operations for each size of power and equipment unit, see Tables 13a to 13d in Appendix.

Table 23. Labor and power required per acre for the usual operations in growing and harvesting grain sorghum for forage

Operation	Horse-drawn equipment				Tractor-drawn equipment					
	One-row		Two-row		Two-row			Three- and four-row		
	Hours per acre									
	Man	Horse	Man	Horse	Man	Horse	Tractor	Man	Horse	Tractor
Seed bed preparation	2.90	6.98	1.71	7.85	1.25	----	1.25	.64	----	.64
Planting	1.47	2.94	.67	3.35	.52	----	.52	.31	----	.31
Machine cultivation	2.74	5.51	1.40	5.57	1.16	----	1.16	.58	----	.58
Hoe	.82	----	.82	----	.82	----	----	.82	----	----
Total previous to harvest	7.93	15.43	4.60	16.77	3.75	----	2.93	2.35	----	1.53
Bind	1.42	4.27	1.42	4.27	1.42	4.27	----	1.42	4.27	----
Shock	2.22	----	2.22	----	2.22	----	----	2.22	----	----
Haul and stack	4.27	4.27	4.27	4.27	4.27	4.27	----	4.27	4.27	----
Total harvest	7.91	8.54	7.91	8.54	7.91	8.54	----	7.91	8.54	----
Total hours per acre	15.84	23.97	12.51	25.31	11.66	8.54	2.93	10.26	8.54	1.53

Small Grain

A total of 2.5 hours of man labor are used per acre for small grain production, previous to harvesting, on farms using horse-drawn equipment and 1.5 hours on farms using tractor-drawn equipment. (See Table 24.)[1] All horse-powered farms used equipment of the same size

Table 24. Labor and power required per acre for the usual operations in growinig and harvesting small grain

Operation	Horse-drawn equipment			Tractor-drawn equipment		
	Hours per acre					
	Man	Horse	Tractor	Man	Horse	Tractor
Land preparation	1.78	7.12	----	1.05	----	1.05
Drilling	.74	2.95	----	.48	----	.48
Total previous to harvest	2.52	10.07	----	1.53	----	1.53
Bind	.66	2.63	----	----	----	----
Shock	1.32	----	----	----	----	----
Tresh	3.24	5.01	.31	----	----	----
Combine	----	----	----	.76	----	.38
Haul to bin or market	.45	.90	----	.35	----	.35[1]
Total harvest	5.67	8.54	.31	1.11	----	.73
Total hours per acre	8.19	18.61	.31	2.64	----	2.26

[1]Truck or car and trailer.

for small grain. Likewise, all farms with tractors used equipment of the same size. The amounts of labor used in producing small grain previous to harvesting are less than for any other crop grown in this area. The difference is largely accounted for in cultivating and hoeing and in the greater amount of labor spent in seed bed preparation for row crops. It is possible to plant small grain with no land preparation. This is especially true if small grain follows cotton. The usual practice, however, is to flat break or one-way the land in preparation for small grain.

The time requiments for harvesting small grains are based on the average yields of 10.2 bushels of wheat and 30.3 bushels of oats per acre. Differences in methods of harvesting account for much of the difference in the amounts of labor used. An average 5.7 hours of man labor per acre was used in harvesting small grain on farms using horse-drawn equipment and 1.1 hours on farms with tractors. Oats were the principal small grain on farms using horse power, while wheat was the principal small grain on farms using tractors. The usual method of harvesting on farms with horse-drawn equipment is to bind and thresh, while tractor farms generally use a combine. Some combining on a custom basis, however, is done on farms using horse power. In such cases, the

[1]For individual operations for different power units see Tables 14a and 14b in Appendix.

usual amounts of labor and power used for harvesting were the same as on tractor operated farms.

Sudan Pasture

Two-row horse-drawn and two-row tractor-drawn equipment are the most common types of equipment in the Rolling Plains Farming Area. With these types of equipment 3.4 hours and 2.7 hours of man labor per acre, respectively, were used in producing sudan pasture. (See Table 25.)[1] This is less labor than was used in the production of other row-

Table 25. Labor and power required per acre for the usual operations in growing sudan pasture

Operation	Two-row horse		Two-row tractor	
	Hours per acre			
	Man	Horse	Man	Tractor
Seed-bed preparation	1.56	7.16	1.17	1.17
Planting	.66	3.28	.51	.51
Machine cultivation	1.20	4.83	1.00	1.00
Total hours per acre	3.42	15.27	2.68	2.68

crops. Although sudan receives almost as much cultivation as grain sorghum for forage, it is not hoed and less time is spent in seed-bed preparation.

Seasonal Distribution of Labor Requirements

In planning the individual farm program the various enterprises should be studied with respect to the distribution of labor power and machinery requirements to determine the workability of different combinations. A combination of several crop enterprises having heavy labor and power requirements at the same time may result in inefficient use of available labor and capital. On the other hand a combination may be effected which would result in a more even distribution of labor and power requirements throughout the crop season and, consequently, in a lower investment in power and machinery as well as the employment of a minimum amount of seasonal labor.

The monthly distribution of labor per acre used in the production and harvesting of the principal crops for farms using two-row tractor-drawn equipment is shown in Figure 4. The keenest competition for labor occurs during the months of May and June. With all crops competing

[1]For individual operations for different power units see Tables 15a and 15b in Appendix.

for labor, power, and machinery at this time, the acreage which can be devoted to row-crops is limited to the acreage which can be planted and cultivated during these critical periods. If extra labor is hired for planting and cultivating, extra power and machinery must also be provided. Hoeing and cotton chopping also make heavy demands for labor during this period, but extra labor may be employed for these operations without increasing the investment in power and machinery. Harvesting of small grain also occurs during this period. It has been customary to harvest small grain with contract labor, and for this reason the acreage of row crops which the operator can handle is not greatly affected.

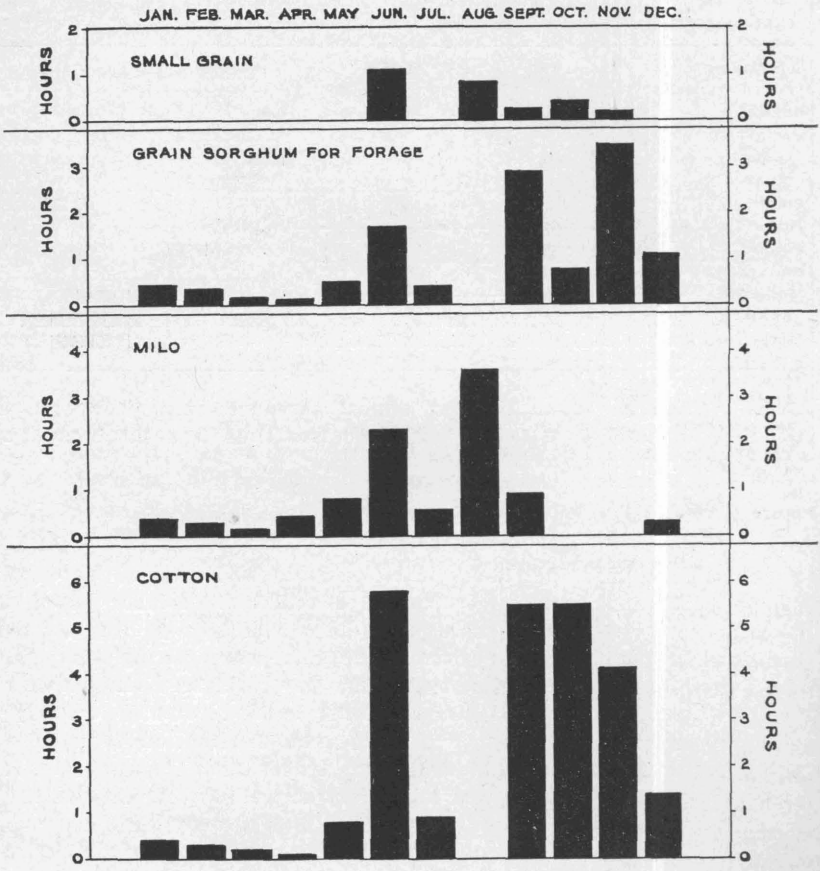

Figure 4. Seasonal distribution of labor requirements per acre for the production and harvesting of crops on farms using two-row tractor-drawn equipment.

The peak labor period for milo is during the harvest season in August when there is no demand for labor for other row-crops. Family labor

usually is used for the most part in harvesting milo. Forage sorghums compete directly with cotton for harvest labor. Cotton is harvested largely with hired labor, however, thus permitting the family to harvest the small acreage of forage sorghum normally grown.

The seasonal distribution of the labor requirements per acre for the various operations in the production and harvesting of cotton is presented in Figure 5. The bar indicates the periods of time during which the various operations are usually performed. The columns at the left of the chart show the hours of man-labor normally used per acre for the various operations with different kinds of power and equipment. The lines at the bottom of the chart indicate the total hours of man labor and the monthly distribution of this labor for the different sizes of power and equipment units. It will be noted that in some instances more than one operation is shown on a line. These are operations which are interchangeable depending upon the type of soil or the type of power and equipment used. Flat breaking is more common than onewaying, but onewaying partially replaces flat breaking on farms using tractor power. Listing commonly replaces bedding,[1] and knifing before planting replaces

OPERATION	MAN HOURS PER ACRE 1-R H	2-R H	2-R T	4-R T	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
SEED BED PREPARATION																
CUT STALKS	.41	.17	.13	.06												
FLATBREAK OR ONE-WAY	.48	.48	.34	.09												
HARROW	--	.06	.01	.01												
LIST OR BED	1.75	.93	.70	.36												
CULTIVATE BEDS	.42	.22	.13	--												
PLANT	1.92	.90	.70	.39												
MACHINE CULTIVATION																
HARROW OR KNIFE	.26	.17	.10	--												
CULTIVATE	4.22	2.13	1.22	.88												
CHOP	2.48	2.48	2.48	2.48												
HOE	2.90	2.90	2.90	2.90												
POISON	.08	.08	.06	.06												
HARVEST:																
PICK	2.70	2.70	2.70	2.70												
SNAP	12.28	12.28	12.28	12.28												
HAUL TO GIN	1.33	1.33	1.20	1.20												
TOTAL HOURS PER ACRE																
ONE-ROW HORSE	31.23	--	--	--	.96	.78	.53	.08	2.13	8.23	1.50	--	5.54	5.54	4.19	1.75
TWO-ROW HORSE	--	26.83	--	--	.55	.42	.29	.04	1.04	6.53	1.09	--	5.54	5.54	4.19	1.61
TWO-ROW TRACTOR	--	--	24.95	--	.41	.31	.18	.03	.78	5.80	.88	--	5.50	5.50	4.15	1.41
FOUR-ROW TRACTOR	--	--	--	23.41	.19	.16	.04	--	.39	5.50	.82	--	5.50	5.50	4.15	1.16

Figure 5. Man labor and power requirements for the production of cotton by operation and by size and type of equipment, the usual distribution by months, and the periods of time during which the operations are usually performed.

[1]In the Rolling Plains, preparing the seed bed with a 14- to 16-inch lister point is commonly referred to as "listing," while a 20- to 22-inch sweep is used in "bedding."

cultivating beds on the sandy upland soils. Knifing after planting likewise replaces harrowing.

The monthly distribution of labor requirements per acre for the production and harvesting of milo with different sizes of power and equipment units are shown in Figure 6. Most of the operations involved in

OPERATION	MAN HOURS PER ACRE 1-R H	2-R H	2-R T	4-R T	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
SEED BED PREPARATION:																
CUT STALKS	.40	.16	.13	.06												
FLAT BREAK OR ONE-WAY	.28	.28	.23	.08												
HARROW	--	.04	.01	.01												
LIST OR BED	1.58	.83	.63	.34												
CENTER FURROW	.13	.07	--	--												
CULTIVATE BEDS	.30	.16	.08	--												
PLANT	1.54	.71	.55	.32												
MACHINE CULTIVATION:																
HARROW OR KNIFE	.23	.15	.09	--												
CULTIVATE	2.91	1.47	.84	.61												
HOE	2.64	2.64	2.64	2.64												
HARVEST:																
HEAD AND HAUL IN	4.50	4.50	4.50	4.50												
TOTAL HOURS PER ACRE ONE-ROW HORSE	14.51	--	--	--	.84	.80	.45	1.29	2.82	2.74	.53	3.60	.90	--	--	.54
TWO-ROW HORSE	--	11.01	--	--	.47	.43	.23	.60	1.44	2.43	.53	3.60	.90	--	--	.38
TWO-ROW TRACTOR	--	--	9.70	--	.36	.28	.13	.46	.85	2.30	.53	3.60	.90	--	--	.29
FOUR-ROW TRACTOR	--	--	--	8.56	.18	.15	.04	.26	.55	2.23	.53	3.60	.90	--	--	.12

Figure 6. Man labor and power requirements for the production of milo by operations and by size and type of equipment, the usual distribution by months, and the periods of time during which the operations are usually performed.

seed-bed preparation are performed within the same periods as those for cotton. These operations usually are performed for the entire farm at one time regardless of the crop to follow. The important feature to note is that the bulk of milo planting is done in April whereas cotton is normally planted during May. Milo harvesting also comes approximately a month ahead of cotton harvesting. There is a period of competition during May and June when milo is being cultivated and cotton is being planted and cultivated. There is considerable tolerance, however, with respect to the time of cultivating milo, and the competition is more apparent than real. This lack of competition with cotton for labor partially accounts for the importance of milo in the cropping systems of the area.

The monthly distribution of the labor requirements per acre for the production and harvesting of grain sorghum for forage is shown in Figure 7. The forage sorghums are planted later than other row crops necessitating additional cultivation before planting in order to check the weed growth. This explains the longer period of time for performing this operation in the production of forage sorghums as compared with cotton and milo. Hoeing and cultivating after planting are done at

essentially the same time as for cotton. Harvesting dates also conflict somewhat with those for cotton. Binding and shocking usually are performed during the early part of the cotton harvesting. Hauling and stacking are done approximately a month later during the latter part of the period of cotton harvesting.

OPERATION	MAN HOURS PER ACRE				JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
	1-R H	2-R H	2-R T	4-R T												
SEED BED PREPARATION:																
CUT STALKS	.33	.13	.10	.05												
FLAT BREAK OR ONE-WAY	.30	.30	.24	.08												
HARROW	--	.06	--	.01												
LIST OR BED	1.78	.94	.72	.40												
CENTER FURROW	.11	.07	.05	--												
CULTIVATE BEDS	.38	.20	.16	.10												
PLANT	1.47	.67	.52	.31												
MACHINE CULTIVATION:																
HARROW OR KNIFE	.15	.10	.06	--												
CULTIVATE	2.59	1.30	1.10	.58												
HOE	.84	.84	.84	.84												
HARVEST:																
BIND	1.42	1.42	1.42	1.42												
SHOCK	2.22	2.22	2.22	2.22												
HAUL AND STACK	4.27	4.27	4.27	4.27												
TOTAL HOURS PER ACRE																
ONE-ROW HORSE	15.86	--	--	--	.92	.88	.39	.17	1.34	3.05	.70	--	2.91	.73	3.42	1.35
TWO-ROW HORSE	--	12.52	--	--	.52	.48	.20	.09	.84	1.85	.44	--	2.91	.73	3.42	1.24
TWO-ROW TRACTOR	--	--	11.70	--	.39	.36	.16	.07	.49	1.65	.40	--	2.91	.73	3.42	1.12
FOUR-ROW TRACTOR	--	--	--	10.28	.21	.18	.08	.04	.27	1.18	.30	--	2.91	.73	3.42	.96

Figure 7. Man labor and power requirements for the production of grain sorghums for forage by operations and by size and type of equipment, the usual distribution by months, and the periods of time during which the operations are usually performed.

The monthly distribution of the labor requirements per acre for the usual operations for the production and harvesting of small grain is indicated in Figure 8. All data are based on the figures for wheat and oats. It will be noted that both are seeded during the same period. Wheat and oats are planted when the moisture is available and not on any set schedule. Both are harvested at approximately the same period. Dates on binding and threshing are for oats, while combining dates are for wheat. Threshing extends over a longer period than combining or binding. It is not so urgent an operation as the other two and usually is done with contract labor and equipment. Some farmers may be able to thresh the grain as soon as it is cut, while others may have to wait several weeks. Although combining usually is done with contract labor and equipment, it cannot be postponed as long as threshing. Grain is more susceptible to damage while standing in the field after it has ripened than after it has been bound and shocked.

OPERATION	MAN HOURS PER ACRE		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
	HORSE-DRAWN	TRACTOR DRAWN												
LAND PREPARATION:														
FLAT BREAK OR ONE-WAY	1.67	1.02												
HARROW	.11	.03												
DRILL	.74	.48												
HARVEST OATS:														
BIND	.66	--												
SHOCK	1.32	--												
THRESH	3.24	--												
HAUL	.45	--												
HARVEST WHEAT:														
COMBINE	--	.76												
HAUL	--	.35												
TOTAL HOURS PER ACRE														
HORSE-DRAWN EQUIP.	8.19	--	--	--	--	--	--	4.93	.74	1.34	.42	.61	.15	--
TRACTOR-DRAWN EQUIP.	--	2.64	--	--	--	--	--	1.11	--	.82	.23	.38	.10	

Figure 8. Man labor and power requirements for the production of small grains by operations and by size and type of equipment, the usual distribution by months and the periods of time during which the operations are usually performed.

PRODUCTION AND PRODUCTION REQUIREMENTS OF LIVESTOCK

The production of livestock and livestock products is of minor importance on the majority of farms in the area. Land suitable for cultivation has, for the most part, been devoted to the production of cash crops while the acreage devoted to native pasture on the average farm in the area is small. Consequently, livestock other than workstock usually are kept primarily to supply family needs, with some sales of surplus products.

The records obtained on the production requirements of livestock cover the period from October 1935 through September 1936. These requirements include amounts of the various feeds, hours of chore labor, and veterinary and other costs.

Dairy Cattle

One hundred and eighty-five farms, or 94 per cent of the 197 farms studied, reported dairy cows. An average of almost 4 cows per farm was maintained. (See Table 26.) The average production per cow was 154 pounds of butterfat. Slightly more than half of the total butterfat produced was sold. Cream, which was usually sold on a butterfat basis, made up almost three-fourths of the sales of dairy products, butter accounted for 25 per cent, while whole milk constituted only 1 per cent of the total sales. Butter usually was sold to the local retail stores which marketed the butter locally. The local retail stores also handled a large percentage of the cream as receiving stations for the creameries.

In some of the larger towns, the creameries maintain their own receiving stations and very little cream is handled by the local retail stores.

Table 26. Production of dairy products

Items	Average 185 farms	18 selected farms
Number of cows per farm	3.9	5.4
Butterfat production per cow (Pounds)	154	160
Proportion of butterfat sold (Per cent)	51.9	60.6
Proportion of dairy products sold as:	Per cent	Per cent
Cream	73.8	64.5
Butter	25.1	32.1
Whole milk	1.1	3.4

The 18 selected farms for which production requirements data were secured averaged 5.4 cows per farm in 1935. Butterfat production per cow was slightly higher than on the 185 farms, averaging 160 pounds per cow. Sixty per cent of the total butterfat production was sold and a larger proportion of the sales of dairy products consisted of butter

Table 27. Production requirements of dairy cattle per milk cow and calf

Items	Total for year	Oct.–Dec. 1935	Jan.–Mar. 1936	Apr.–June 1936	July–Sept. 1936
Feed:	Pounds	Pounds	Pounds	Pounds	Pounds
Milo grain	364	115	104	88	57
Cottonseed	219	85	55	29	50
Cottonseed meal	267	93	81	49	44
Other concentrates	73	18	15	13	27
Total concentrates	923	311	255	179	178
Cane bundles	3,414	1,258	1,108	503	545
Other grain sorghum bundles	841	312	167	128	234
Dehorned bundles	242	92	90	60	----
Other roughage	344	76	96	60	112
Total roughage	4,841	1,738	1,461	751	891
	Days	Days	Days	Days	Days
Native pasture	77	15	19	31	12
Sudan pasture	90	13	----	27	50
Small grain pasture	57	7	42	6	2
Field pasture	25	13	5	----	7
Total pasture	249	48	66	64	71
Man labor (Hours)	151	40	41	34	36

and whole milk than on the average farm. Slightly less than two-thirds of the dairy products sold on the 18 selected farms was sold as cream, approximately one-third was sold as butter, and about 3 per cent was sold as whole milk.

All cows reported on the 18 farms were Jerseys, but only 18 per cent were pure bred. Eighty-six per cent of the bulls kept were pure bred, indicating that farmers are endeavoring to improve the dairy cattle by the use of pure bred dairy sires. A few farms, however, frequently use a beef type sire to increase the value of the calves for beef purposes. This practice, however, usually is found only on farms on which production is largely for home consumption.

An average for the year of 923 pounds of concentrates, consisting chiefly of milo, cottonseed, and cottonseed meal, was fed per milk cow and calf on the 18 selected farms. (See Table 27.) An average of 4,841 pounds of forage was also fed per cow. In addition, the cows were on pasture 249 days during the year. This is approximately 65 days more than on the average farm, and the difference was largely the result of greater use of small grain pastures and field pastures. The man labor requirements with dairy cattle were 151 hours of man labor per cow and calf. Since the man labor requirements for dairy cattle are fairly uniform throughout the year, they compete for labor to a certain extent with all other enterprises.

Poultry

An average of 100 hens per farm was maintained on 185 of the 197 farms studied. (See Table 28.) Eggs are the principal product of the poultry interprise and the average production was 85 eggs per hen. Meat

Table 28. Production of poultry products, 1935

Items	Average 185 farms	18 selected farms
Average number of hens per farm	100	109
Number of eggs produced per hen	85	110
Proportion of eggs sold (Per cent)	71	74
Baby chicks:		
Number hatched	109	110
Number purchased	94	113
Proportion chicks lost (Per cent)	31	34
Proportion hens lost (Per cent)	17	20
Number of hens used in home	5	2
Number of fryers used in home	54	55
Proportion of hens sold	23	24
Proportion of chicks to be sold	20	19

is produced chiefly for home consumption. It will be noted that 71 per cent of the eggs produced were sold, while most of the meat produced as fryers was used in the home. Local retail stores and hatcheries furnished the principal markets for eggs.

The poultry enterprise on the 18 farms for which production requirements data were secured was not greatly different in size than on the average farm. The average production on these 18 farms, however, was 110 eggs per hen and a larger proportion of the total production was sold. The meat produced on these farms was disposed of in much the same way as on the average farm. The principal object of the poultry enterprise—namely, egg production—is reflected in the popularity of the Leghorn breeds of chickens, which constituted almost two-thirds of the chickens on the farms studied. The heavy breeds accounted for almost one-fourth of the poultry, with mixed breeds accounting for the remainder.

The production requirements of poultry per 100 hens are presented in Table 29. Home grown grains provided the major part of the feeds

Table 29. Production requirements of Poultry per 100 hens

Kind of Feed	Amount
	Pounds
Grain:	
Milo	3,827
Corn	68
Wheat	77
Oats	128
Total grain	4,100
Mash and mill feeds:	
Bran	665
Shorts	495
Laying mash	375
Chick starter	137
Growing mash	100
Other concentrates	34
Total mash and mill feeds	1,806
Total concentrates	5,906
Skim milk	5,574
Minerals	47
Man labor (Hours)	279

fed to poultry. These were supplemented with commercial and home-mixed mash and mill feeds. The feeds required for all poultry per 100 hens were 4,100 pounds of grain, 1,806 pounds of mash and mill feeds, 5,574 pounds of skim milk, and 47 pounds of minerals, chiefly oyster shell, salt, and bone meal.

The feeding of bran, shorts, and laying mash was fairly constant throughout the year. Other feeds fed fluctuated with the number and size of the young chicks. It was a common practice to start baby chicks on commercial chick starter. Growing mash was then used until the chicks reached fryer size, or larger. The greatest quantities of grain were fed during the periods from April through September. It was during these periods that grain requirements of the young chicks were

greatest. The least amount of feed was used in the period from October through December after all fryers had been disposed of and before any chicks had been hatched. The hours of man labor per 100 hens were fairly constant throughout the year except for the period from April through June. Considerable extra time was necessary during this period in the care and feeding of baby chicks.

Swine

Twenty-five per cent or 49 of the 197 cooperating farmers kept brood sows in 1935. There was an average of 1.4 sows on these farms as of January 1935. (See Table 30.) Approximately 12 pigs were farrowed

Table 30. Production of pork

Items	Average 49 farms	13 selected farms
	Number	Number
Sows per farm, January 1935	1.4	1.5
Boars per farm, January 1935	.1	.1
Other hogs per farm, January 1935	.5	.1
Pigs farrowed	11.7	11.7
Pigs weaned	10.4	9.5
Total pork produced (Pounds)	1,461	1,680

per farm during the year. The amount of pork produced is relatively low for the number of pigs farrowed, largely owing to the fact that a large percentage of the pigs were sold as soon as possible after weaning. Most of the pigs were sold to local farmers for the production of meat for home consumption.

Table 31. Production requirements of pork

Items	Average
Number of farms	14
	Pounds
Amount of feed per 1000 pounds pork produced:	
Grain and other concentrates—	
Milo grain	4,695
Corn	205
Threshed barley	99
Protein supplements	368
Total concentrates	5,367
Skim milk	6,868
Pasture: Sudan (Days)	13
Small grain (Days)	8
Total pasture days (Days)	21
Man labor (Hours)	115

The swine enterprise on the farms for which production requirement data were secured did not differ greatly from that on the 49 farms maintaining brood sows. Production of pork on these farms was higher than average, owing to the fact that a larger proportion of the pigs were sold as market hogs rather than as weaning pigs.

Fifty-five per cent of the sows on the farms studied were Chester Whites. Mixed breeds constituted 18 per cent, while the remainder were evenly divided between the Hampshire and Poland China breeds.

The amounts of feed required to produce 1000 pounds of pork, live weight, were 4,999 pounds of grain, 368 pounds of protein supplements, 6,868 pounds of skim milk, and 21 days of pasture. (See Table 31.) Practically all of the feeds used were produced on the farm, except protein supplements. Man labor used on hogs amounted to 115 hours for each 1000 pounds of pork produced.

Beef Cattle

Only 12 of the farms studied reported beef cattle in 1935. With a continued reduction of the cotton and wheat acreages, however, increasing interest has been shown in the feeding of calves for the beef market. This enterprise may follow one of two general plans: (1) Buy dairy type calves or any other calves that may be available and graze on sudan pasture for a period of approximately 100 days; and (2) Buy good grade beef type yearling calves and feed out for a period of 180 days. The first practice is usually found only on smaller farms which do not have a large supply of grain but do have a small acreage which may be devoted to sudan pasture. Farms following this practice usually handle only a small number of calves. The calves usually weigh about 400 pounds when put on pasture and are sold at approximately 550 pounds.

The second practice is usually found on the larger farms which have a surplus of grain and roughage. These farms buy good grade beef type yearling calves weighing about 500 pounds which are sold at 850 pounds. The feeds required to produce a 350 pound gain per animal are shown in Table 32.

FARM PRODUCTS USED IN THE HOME

The quantities and value of the farm products used in the home on the farms studied are shown in Table 33. The total value of the products in the home averaged $216 per farm. This represents an important part of the food consumed by the farm family. The farm products used in the home consisted to a large extent of livestock products. About 43 percent of the total value of these products consisted of whole milk and butter. Meat for the farm family was furnished chiefly by pork and poultry, with an average of 544 pounds of pork and 56 heads of poultry.

Table 32. Production requirements of feeder calves

Items	Amount
Feed:	Days
Pasture—	
Field	20
Small grain	30
Sudan	20
Total pasture days	70
	Pounds
Milo grain	1,500
Cottonseed meal	350
Total concentrates	1,850
Grain sorghum forage	1,500
Medicine and vaccine (Dollars)	.20
Man labor (Hours)	10

Poultry also furnished an average of 172 dozen eggs a year for home use. Only 15 per cent of the farms killed a calf for beef for use by the farm family.

Climatic conditions and lack of an adequate water supply limit the use of farm gardens and orchards which furnished only a small part of

Table 33. Quantity and value of farm products used in the home

Items	All farms	Soils Groups			
		Heavy dark upland	Heavy reddish upland	Sandy upland	Bottom-land
Number of farms	197	122	34	31	10
Quantity of products used:					
Milk (Gallons)	507	511	603	388	545
Butter (Pounds)	79	67	76	124	89
Eggs (Dozen)	172	183	165	140	161
Poultry (Number)	56	54	63	59	48
Pork (Pounds live wt.)	544	557	561	549	315
Beef (Pounds live wt.)	61	69	54	34	60
Corn (Bushels)	2	1	3	2	10
	Dollars	Dollars	Dollars	Dollars	Dollars
Value of products used, 1935:					
Milk	71.01	71.46	84.52	53.19	76.30
Butter	21.54	18.85	19.75	33.56	23.03
Eggs	27.55	29.27	25.81	22.45	28.18
Poultry	23.80	22.83	25.67	26.88	19.85
Pork	48.10	49.70	48.87	47.64	27.41
Beef	2.76	3.15	2.44	1.54	2.73
Corn	1.23	.80	1.70	1.13	5.15
Garden and orchard	19.79	18.96	15.79	17.74	49.50
Total value	215.78	215.02	224.55	204.13	232.15
Farms with gardens (Per cent)	65	68	64	55	60

the farm products used in the home. The gardens furnished a limited number of seasonable vegetables for current home needs, with some surplus for canning. Gardens were reported on 65 per cent of the farms studied, but only an occasional farm reported an orchard and these were largely on the sandy soils.

FARM POWER

The physical characteristics of Type-of-Farming Area 4c are favorable to the adoption of low cost methods of crop production which are attained through the use of large-scale machinery. Consequently, adjustments have been made and likely will continue in the direction of increasing the size of the farm unit as far as the competition for land will permit. In some cases the amount of land available to the farmer is fixed, at least for the time being. In such cases, the important problem is the selection of the type and size of power unit which is best suited to the particular farm. Many farmers, however, do have the opportunity to increase the size of the farm unit. In such cases, it is useful to know how much cropland can be handled with each type and size of power unit available. A description of the workstock enterprise is presented in the discussion which follows. The requirements of feed and materials are enumerated as well as the cost of horse work. The costs of tractor work also are presented. The optimum acreages of crops are given for the different kinds and types of power and equipment. In addition, the factors which may affect the choice of power on the individual farm are evaluated.

Workstock

One-row horse-drawn equipment was the largest available to farmers during the early agricultural development of the area. Consequently, the amount of cropland which could be handled by one man was small. Two-row horse-drawn equipment was introduced into the area during the decade from 1920 to 1930. As a result the amount of cropland that could be handled by one man was greatly increased. Increases in the average size of farms followed. These were accomplished by the consolidation of existing farm units and by breaking out new land. At the present time one-row horse-drawn equipment is used on a comparatively small percentage of the farms in the area.

The data relating to workstock are representative of the practices and requirements in the area for farms which rely on horses for power. The farms on which workstock practices were studied had an average of 142 acres of cropland per farm. (See Table 34.) In January 1936, these farms had an average per farm of 5.6 horses over two years of age. The difference between the total number of horses and the number used for field work was accounted for largely by animals too old to work and by young stock which had not been broken. The outstanding characteristic of the workstock on these farms was the high average age. Less than 4 per cent of the workstock were under two years of age and only 11 per

Table 34. Workstock enterprise on 34 selected horse power farms

Items	Average
Acres in cropland	142.0
Number of workstock over 2 years, January 1936	5.6
Average weight (Pounds)	1,152
Number of workstock under 2 years, January 1936	.2
Number used for field work	5.2
Crop acres per head of stock used for field work	27.3
	Per cent
Proportion of all workstock of various ages:	
Under 4 years	11.2
4–7 years	12.7
8–11 years	25.9
12–15 years	38.5
16 years and over	6.6
Unknown	5.1

cent were under four. In contrast, 45 per cent of the workstock were over eleven years of age. It is evident from the comparatively small number of young stock that these farms are not raising enough colts to maintain their workstock. This means that farmers in the area must depend on purchased stock from other areas for replacements, or that workstock will be replaced to a greater extent by tractors.

Workstock were used on an average of 122 days per head during the year. (See Table 35.) Almost all of the feeds used for workstock were

Table 35. Production and requirements of workstock per work animal

Items	Total	Oct.–Dec. 1935	Jan.–Mar. 1936	Apr.–June 1936	July–Sept. 1936
Days worked	121.7	13.2	33.4	49.6	25.5
	Pounds	Pounds	Pounds	Pounds	Pounds
Feed:					
Milo grain	2,712	455	862	965	430
Threshed oats	479	90	109	166	114
Other concentrates	223	54	63	53	53
Total concentrates	3,414	599	1,034	1,184	597
Hegari bundles	749	203	220	233	93
Feterita bundles	495	125	132	151	87
Cane bundles	3,489	768	1,082	1,015	624
Sudan bundles	108	27	27	27	27
Other roughage	84	5	11	18	50
Total roughage	4,925	1,128	1,472	1,444	881
	Days	Days	Days	Days	Days
Native pasture	38	7	9	13	9
Sudan pasture	73	8	1	18	46
Small grain pasture	11	4	5	1	1
Field pasture	25	15	7	----	3
Total pasture	147	34	22	32	59
Man labor (Hours)	54	9	15	18	12
Veterinary cost per farm (Dollars	1.22	----	----	----	----
Other costs per farm (Dollars)	2.06	----	----	----	----

produced on the farm. The total amount of feed required per horse was 3,414 pounds of grain and other concentrates, 4,925 pounds of roughage, and 147 days of pasture. In addition, 54 hours of man labor were used per head in the care and feeding of workstock. The periods of heaviest feeding were during the first half of the year when power requirements are greatest.

The cost of keeping workstock is of prime importance in comparing the costs of farm power. The cost of maintaining a horse for the year on the farms studied was $82.18, consisting of $46.97 for feed and $35.21 for overhead and other costs. (See Table 36.) It will be noted

Table 36. Cost of horse work

Items	Average
Number of farms	34
Crop acres per farm (Acres)	142
Horses per farm (Number)	5.2
Average investment per horse (Dollars)	92.34
Crop acres per horse (Acres)	27.3
Days worked per horse (Days)	122
	Dollars
Feed costs per horse	
Grain	29.82
Forage	12.25
Pasture	4.90
Total feed costs	46.97
Feed cost per day's work	.38
Other costs per horse:	
Labor[1]	6.25
Interest	5.54
Depreciation	15.56
Shelter, water, etc.	6.75
Taxes	.52
Veterinary and other costs	.59
Total other costs	35.21
Total cost per horse	82.18
Total cost per farm	427.34
Total cost per crop acre	3.01
Cost per day's work per horse	.67

[1]50 hours man labor per horse.

that feed costs, which are related to the munber of days horses are worked, made up almost 60 per cent of the cost of maintaining workstock. These costs were based on the average prices and values which prevailed in 1935.

Tractor Power

The all-purpose tractor, as a source of farm power, was introduced into the area shortly after 1925. The substitution of tractor power for

horse power has taken place at a greatly accelerated rate since 1933. Improvements in the all-purpose tractor, higher prices of feed and workstock, and low prices of cotton greatly stimulated the use of the tractor. Although these adjustments are taking place rapidly, only about 40 per cent of the farms studied in 1935 used tractors.

In contrast with the expense of maintaining workstock, the greater part of the costs of operating tractors was for overhead expenses. (See Table 37.) Since these costs remain practically the same regardless of

Table 37. Cost of tractor work

Items	Type of equipment used			
	Two-row		Four-row	
Number of farms	54		5	
Crop acres per farm (Acres)	174		148	
Average value per tractor (Dollars)	678.93		756.09	
Days used per year (Days)	62		40	
Operating costs:	Amount	Cost	Amount	Cost
Fuel—	Gals.	Dollars	Gals.	Dollars
Gasoline	495	42.85	562	49.62
Kerosene	594	36.04	469	26.88
Distillate	59	4.15	----	-----
Oil	36	18.58	32	18.05
Grease (lbs.)	32	3.63	20	2.28
Total fuel, oil, and grease		105.25		96.83
Fuel, oil, and grease per day's work		1.70		2.42
Overhead costs:				
Labor		8.00		6.00
Repairs		25.47		23.00
Interest		40.13		45.37
Depreciation		112.68		95.57
Shelter, water, etc.		8.00		8.00
Taxes		3.77		3.89
Total overhead costs		198.05		181.83
Total costs per farm		303.30		278.66
Total costs per crop acre		1.74		1.88
Total costs per day's work		4.89		6.97

the number of days worked, the cost per day of tractor work decreases much more rapidly with an increase in the number of days worked than does the cost of keeping workstock. Fuel, oil, and grease made up only about one-third of the total cost of operating tractors. Although the total cost per farm was less for tractor power than for horse power, the most significant difference was in the cost per crop acre. The power cost per crop acre was $1.74 on farms using two-row tractor-drawn equipment and $1.88 on farms using four-row tractor-drawn equipment as compared to a cost of $3.01 per crop acre on farms using horses for power.

A significant fact brought out in the cost of power is that horse power was used almost to capacity, while in the case of tractor power land

resources were far short of the amount necessary to utilize the available power units to capacity. This was particularly true on the farms using four-row tractor equipment. These farms were smaller in size on an average than farms using two-row tractors. This fact should be taken into consideration in comparing the overhead costs of tractor power. Adjustments were made for this discrepancy in setting up basic requirements to be used in evaluating alternative adjustments in the organization and operation of farms in the area. Operating costs and rates of performance were not affected by a lack of capacity use, since these tend to remain the same per day and per acre regardless of the number of days worked.

Optimum Crop Acreages for Different Sizes of Power and Equipment Units

In the selection of the power and equipment unit for a farm, it is essential to know how much cropland can be operated with the kinds and types of power and equipment now available to farmers in the area. These acreages will vary depending on the system of farming. Under a row-crop system of farming, the acreage of cotton which can be handled with the different sizes of power and equipment units is an essential consideration, since cotton is the most important crop. The optimum acreages of row crops are based on the usual rates of performance with the different sizes of power and equipment units on the farms studied and upon an estimated optimum length of planting period for cotton of 7 days and an estimated optimum length of cultivation period for all row crops of 10 days. It should be noted that the restrictions of the AAA program are not taken into consideration in setting up these optimum acreages.

The optimum acreage of row crops for a farm using one set of one-row horse-drawn equipment is 80 acres. (See Table 38.) The opti-

Table 38. Optimum crop acreages for a row-crop system of farming

Items	Power and equipment unit			
	One-row horse	Two-row horse	Two-row tractor	Four-row tractor
Total acres of cropland	80	160	200	380
Acres of cropland in:				
Cotton	50	100	130	230
Milo	19	40	57	132
Forage sorghum	6	11	7	10
Sudan pasture	5	9	6	8

mum acreages for two-row horse-drawn, two-row tractor-drawn, and four-row tractor-drawn equipment are 160, 200, and 380 acres. The acreages of cotton shown are those that can be planted with the different power and equipment units during the optimum planting period for cotton. The balance of the cropland is shown in feed crops. In computing the acreages of the various feeds, it was assumed that the numbers of live-

stock would be the same as those usually maintained on farms of these sizes. The acreages devoted to sudan pasture and forage sorghum are the acreages necessary to furnish pasture and forage for these livestock. The balance of the feed acreage is shown in milo, which is the second most important row crop in the area. In every case the acreage of milo is above that actually required for farm needs.

Under the limitations of the AAA as set out in the 1940 program, the total crop acreages would be increased by approximately 25 per cent for two-row horse outfits and by 35 per cent for two-row tractor outfits. Computations were not made for other sizes, but the acreage that could be handled would be proportionately greater.

Optimum acreages were also computed for cotton-small grain systems of farming. The harvesting of small grain competes with the cultivation of row crops for the available labor and power. On most of the farms studied, however, small grain was harvested with contract labor and equipment. Under these conditions, small grain may be added to the cropping system without reducing the acreage of row crops that can be handled during the period of machine cultivation. Small grain also competes with cotton for the available labor and power during the period of cotton harvesting. As a result, the acreage of small grain which can be grown, in addition to the optimum acreages of row crops, is determined by the amount of time available during this period for drilling the small grain.

The optimum crop acreages for farms using the different power and equipment units and with a cotton-small grain system of farming are shown in Table 39. Wheat is the small grain shown because it is to be

Table 39. Optimum crop acreages for a cotton-small grain system of farming with custom harvesting of small grain

Items	Power and equipment unit			
	One-row horse	Two-row horse	Two-row tractor	Four-row tractor
Total acres of cropland	120	200	260	440
Acres of cropland in:				
Cotton	50	100	130	230
Wheat	40	40	60	60
Milo	19	40	57	132
Forage sorghum	6	11	7	10
Sudan pasture	5	9	6	8

custom combined and used as a cash crop. On the basis of normal yields and the price relationships which have prevailed in the past, oats have an apparent advantage over wheat. Many farmers prefer wheat, however, and have expressed the opinion that wheat is easier to combine than oats and does not shatter as badly. In addition, oats do not give as good grazing during the winter months and are more easily winter killed than wheat. Wheat also may be combined somewhat earlier and is easier to handle.

Under a cotton-small grain system the limitations of the 1940 AAA program would permit increases in total crop acreages of approximately 12½ per cent and 19 per cent for two-row horse and two-row tractor outfit.

It will be noted that the optimum small grain acreage under this system of farming is the same on all farms operated with horse power and also for all farms operated with tractor power. All horse powered farms use the same size and type of equipment for preparing the land and drilling small grain. Likewise, all farms with tractor power use identical equipment.

Optimum acreages for a cotton-small grain system of farming with the power and equipment to be furnished by the operator were also computed for farms using tractor power. Under a row-crop system of farming, the available power and machinery is used to capacity during the month of June on row-crop cultivation. With the optimum acreages of row crops as a base, some time must be released from row crops in order to harvest small grain. Since more machine work is used per acre on cotton during the month of June than on any other crop, the greatest amount of time may be released by reducing the cotton acreage. Assuming the use of a small all-crop harvester, farms using two-row tractor-drawn equipment may substitute 2.5 acres of small grain for every acre diverted from cotton, while farms using four-row equipment may substitute 1.5 acres. The optimum acreages for farms following this system of farming are shown in Table 40.

Table 40. Optimum crop acreages for a cotton-small grain system of farming with power and equipment for harvesting small grain furnished by the operator

Items	Power and equipment unit	
	Two-row tractor	Four-row tractor
Total acres of cropland	260	415
Acres of cropland in:		
Cotton	90	165
Wheat	100	100
Milo	57	132
Forage sorghum	7	10
Sudan pasture	6	8

The acreage of small grain shown in the preceding table is that which is considered sufficient to justify the purchase of the equipment necessary for growing and harvesting small grain. No optimum acreages are shown for farms using horse power and following this system of farming, primarily because these farms do not have the power necessary for operating a combine.

Factors Affecting Choice of Power

The advantages and disadvantages of each type of power are important considerations in the selection of the type of power to be used. Briefly, these factors are the comparative costs and incomes resulting from the use of each type of power, the cost of replacement, adaptability to various size units, timeliness with which operations may be performed, and the acreages which may be operated. The advantages and disadvantages of each type of power under these various conditions determine the type of power which should be selected for a particular farm.

The greatest advantage of horse power over tractor power is the comparatively low cash outlay in using horse power. The largest proportion of the cost of keeping horses consists of feed which is usually grown on the farm. In periods of low feed prices, this would result in a comparatively low cost of horse power. During periods of high feed prices, however, workstock are at a disadvantage. Horses require feed and care when not working, while the tractor requires no attention when not in use.

Another advantage of horse power is that replacement can be brought about gradually. Few losses from old age, disease, and accident occur in any one year. Horses so lost may be replaced by raising colts or by purchasing horses as required. In this way, the depreciation on horse power is taken care of gradually. In the case of the tractor, the initial cost and the outlay for depreciation are met in one year. Tractors may be purchased on terms which extend the payments over two or three years. Although this makes the purchase of the tractor less difficult, it makes the price paid somewhat higher than the cash price.

In the past, horse power has had a decided advantage in its flexibility. Horse power is well adapted to different sizes of power and equipment units, ranging from one-horse units to multi-row equipment. Tractors have been introduced in the past few years, however, that are well adapted to smaller units such as one-row equipment. In a recent study in an adjacent area it was found that one-row tractor equipment had 25 per cent more capacity than one-row horse-drawn equipment. At the present time, tractors are available in a wide range of sizes and types. It is not unlikely that further improvements may be made which will increase the adaptability of the tractor to an even wider range of conditions.

A decided advantage of the tractor is the saving of time and man labor which it affords. The greater speed of the tractor enables one man to cover a larger acreage in a given time that can be done with horse power, reducing the hours of man labor used per acre in machine operations. When used to capacity, the ability to cover a larger acreage with the tractor also makes possible a greater production per man. In addition, the ability to operate a tractor many hours a day without rest makes it possible to accomplish more work at the most advantageous time.

OVERHEAD FARM EXPENSE

The investment in land, improvements, machinery and equipment, and the depreciation and expense connected with these items are other factors which should be taken into consideration in planning the organization and operation of a farm. The amount of the investment, rates of depreciation, and amount of expense were computed from the data secured from the farms included in this study and are adaptable to other farms in the area. The construction cost or the cost new is shown for all items, as well as the depreciated value. Construction cost and cost new are used in computing annual depreciation and repairs, while the depreciated value is used for computing the value of the investment and interest charges.

Land and Improvements

The farmers estimated that the average market value of all land (without improvements) on the farms studied was $33.30 per acre. The amount of the investment in improvements was computed for farms using one set of the different sizes of power and equipment units. These improvements include barns, poultry houses, garages and tractor sheds, fences, and water systems. The construction cost of these improvements (without residence) on the different types of farms were as follows:

Farms using one-row horse-drawn equipment	$435
Farms using two-row horse-drawn equipment	880
Farms using two-row tractor-drawn equipment	640
Farms using four-row tractor-drawn equipment	975

The annual rate of depreciation amounted to 4.5 per cent of the construction cost of these improvements, while the annual repairs amount to 2.5 per cent.

The average depreciated value of the improvements in 1935 on the farms studied were as follows:

Farms using one-row horse-drawn equipment	$166
Farms using two-row horse-drawn equipment	464
Farms using two-row tractor-drawn equipment	360
Farms using four-row tractor-drawn equipment	493

The use of terraces for soil and moisture conservation results in an additional investment in improvements. On the basis of records kept at San Angelo by the Soil Conservation Service, the cost of construction amounts to $54.30 per mile of terrace. With an average of 31.3 acres per mile of terrace, the investment in terraces on the average farm amounts to $1.74 per acre of cropland. The annual cost of maintaining the terraces amounts to $9.89 per mile of terrace or $0.32 per acre.

The feeding of cattle for the beef market would necessitate an added investment in improvements on the average farm in the area. The con-

struction cost of these improvements would amount to $275 on farms using two-row tractor-drawn equipment and $250 on farms using two-row horse-drawn equipment, while the average value over the life of the improvements would be $140 and $125. Depreciation and annual repairs would be at the same rate as for other improvements.

Machinery and Equipment

The machinery and equipment includes tractor and tractor equipment, automobile, wagon, trailer, and the other field machinery. The cost new of the tractors and tractor equipment were as follows:

Two-row tractor and equipment	$1,375
Four-row tractor and equipment	1,700

Depreciation on the tractor and tractor equipment was estimated to be 11 per cent of the cost new, and annual repairs 3 per cent.

The average depreciated values of the tractors and tractor equipment in 1935 were as follows:

Two-row tractor and equipment	$ 880
Four-row tractor and equipment	1,247

The average cost new of the automobile was $735 on the farms studied. Depreciation was computed at the rate of 14 per cent of the new cost. The operating expenses for the automobile, including repairs, amounted to $15.02 per 1,000 miles of operation. Fifty per cent of the automobile expense was estimated to be chargeable to the farm, while the balance was for the personal use of the operator and his family. The amount of driving for farm use on the farms using the various sizes of power and *equipment units* was as follows:

Farms using one-row horse-drawn equipment	2,500 miles
Farms using two-row horse-drawn equipment	3,500 miles
Farms using two-row tractor-drawn equipment	4,000 miles
Farms using four-row tractor-drawn equipment	5,000 miles

The average depreciated values in 1935 of the automobiles on the farms studied were as follows:

Farms using one-row horse-drawn equipment	$125
Farms using two-row horse-drawn equipment	140
Farms using two-row tractor-drawn equipment	160
Farms using four-row tractor-drawn equipment	200

The cost new of other machinery and equipment on farms using one set of the various sizes of power and equipment units were as follows:

Farms using one-row horse-drawn equipment	$480
Farms using two-row horse-drawn equipment	975
Farms using two-row tractor-drawn equipment	480
Farms using four-row tractor-drawn equipment	525

The estimated annual rate of depreciation of other machinery and equipment amounted to 8.5 per cent of the cost new, while annual repairs was 4 per cent.

The average depreciated values in 1935 of other machinery and equipment were as follows:

Farms using one-row horse-drawn equipment	$245
Farms using two-row horse-drawn equipment	461
Farms using two-row tractor-drawn equipment	263
Farms using four-row tractor-drawn equipment	268

The machinery and equipment previously mentioned include only row-crop machinery. A grain drill of the type employed with tractor-drawn equipment had a cost new of $160, while the average depreciated value in 1935 was $80. A grain drill of the type employed by farms using horse power had a cost new of $105 and the average depreciated value in 1935 was $45. Depreciation and normal repairs were at the same rates as for other machinery and equipment.

A small combine of the type being extensively sold in the area had a cost new of $650, while the average value over the life of the combine would be $325. Annual depreciation was computed at the rate of 10 per cent of the cost new, and annual repairs at 4 per cent.

Farmers using tractor power and feeding out cattle for market would find it practical to own their feed grinding equipment, while it would be necessary to hire the feed grinding on farms using horses for power. A feed grinder of the type commonly used for this work would have a cost new of $300 and average value over the life of the mill would be $150. Annual depreciation amounts to 10 per cent of the cost new, while annual repairs amount to 4 per cent. Feed could be ground at the rate of approximately 1500 pounds an hour, with twice as much man labor as tractor work necessary in operating the grinder.

PRICES OF PRODUCTS SOLD AND ITEMS PURCHASED

In planning the farm organization, a careful study should be made of the forces which affect the prices of farm products and the expense of farm operation. By using prices that are likely to prevail at the time expenses and receipts will occur, the farm operator takes a forward looking attitude in planning the farm business. Too often last year's prices serve as the guide for planning production. The farm operator who understands how the various forces operate to influence prices may be able to anticipate the price relationships which are likely to prevail during the crop year and is in a better position to plan year to year adjustments in his farm organization and operation. Such information is published regularly by the Bureau of Agricultural Economics of the United States Department of Agriculture.[1]

[1] "The Agricultural Outlook," also "Situation Reports" for principal agricultural commodities and expense items.

For the purpose of this study, however, prices are used merely to indicate the probable effect of variations in prices and price relationships on the income derived from the various alternative farm organizations. Since it is impossible to predict the future changes in prices and price relationships, widely differing sets of prices which have occurred in the past are used in determining the effect of different price conditions on the income obtained from alternative farm organizations. The prices used in this study cover the years 1927-1935 and 1938. (See Table 41.)

Table 41. Prices of products sold and items purchased

Items	Unit	Prices during the period				
		1927–1935 Dollars	1927–1929 Dollars	1931–1933 Dollars	1934–1935 Dollars	1938 Dollars
Products sold:						
Lint cotton	lb.	.1156	.1673	.0667	.1136	.0769
Cotton seed	Ton	24.30	31.50	11.70	31.00	19.60
Milo grain	100 lbs.	.90	1.10	.45	1.18	.85
Grain sorghum forage	Ton	6.50	8.00	3.25	8.50	6.00
Wheat	Bu.	.85	1.18	.47	.87	.65
Oats	Bu.	.40	.52	.23	.42	.28
Dairy calves	100 lbs.	5.00	7.00	3.30	3.65	5.00
Beef steers	100 lbs.	8.75	11.60	5.40	8.10	8.70
Butterfat	lb.	.26	.38	.15	.22	.25
Hogs	100 lbs.	6.65	8.88	4.33	6.10	8.00
Eggs	Doz.	.20	.26	.13	.18	.19
Fryers	lb.	.22	.30	.16	.17	.15
Hens	lb.	.14	.19	.10	.11	.09
Items purchased:						
Beef calves	100 lbs.	6.90	9.80	4.60	5.10	7.50
Baby chicks	100	9.70	13.00	6.80	7.50	7.00
Weaning pigs	One	3.50	4.50	2.00	2.80	2.50
Bran	100 lbs.	1.35	1.75	.90	1.35	1.25
Shorts	100 lbs.	1.65	2.10	1.10	1.65	1.55
Laying mash	100 lbs.	2.15	2.80	1.50	2.15	2.00
Chick starter	100 lbs.	2.80	3.60	1.90	2.80	2.70
Growing mash	100 lbs.	2.40	3.10	1.60	2.40	2.50
Cottonseed meal	100 lbs.	1.50	2.00	1.00	1.50	1.35
Sudan seed	lb.	.05	.065	.035	.065	.03
Cottonseed for planting	Bu.	1.60	2.10	1.10	2.00	1.25
Cotton snapping, contract	100 lbs.	.45	.60	.30	.45	.50
Ginning	100 lbs.	.30	.40	.25	.30	.30
Bagging and ties	Bale	1.25	1.50	1.00	1.25	1.25
Binder twine	lb.	.093	.12	.06	.12	.09
Combining, contract	Acre	1.50	2.00	1.25	1.50	1.50
Labor	Day	1.25	1.60	.80	1.25	1.25
Feed grinding	100 lbs.	.12	.15	.10	.12	.12
Feed hauling	Ton	1.00	1.25	1.00	1.00	1.00

These prices are based on data secured from local produce dealers, newspapers, and published district price data for Texas products.[2] It will be noted that both the actual prices and the price relationships in the various periods represent widely differing conditions. The period 1927-1929 represents a period of high prices both for products sold and items purchased. In comparison, however, with the period 1927-1935, the prices of cotton and other products were relatively higher than the prices of items purchased. The price of small grain, in addition, was relatively high in comparison to the price of grain sorghum.

[2]Buechel, F. A., "Prices Received by Texas Farmers by Months for Twenty-two Products." Bureau of Business Research, University of Texas, Austin.

In the period 1931-1933, all prices were low in comparison to the prices for the period 1927-1935, but the prices for products sold were relatively lower than the prices for items purchased. The prices received for crops were relatively lower than the prices for livestock and livestock products. The price of small grain had approximately the same relationship of the price of grain sorghum that existed in the period 1927-1929.

In the period 1934-1935, prices approximated the average prices which prevailed from 1927 to 1935. The prices of grain sorghum, however, were higher during this period and were relatively high in comparison to the price of small grain. In this respect, the prices during the period 1934-1935 differed from the prices during the other periods.

Prices of products sold, particularly cotton and small grain were lower in 1938 than during the period 1927-1935. At the same time, the price of small grain was relatively low in comparison to the price of grain sorghum. There were no differences in the prices of several important expense items, namely, cotton ginning and hired labor. Other items of expense were only slightly lower in 1938 than during the period 1927-1935.

ANALYSIS OF ALTERNATIVE ADJUSTMENTS

The adaptability of the various enterprises has been discussed in the previous sections, and basic information pertaining to normal yields, production, and production requirements has been presented. In the following discussion this information is used in a budget analysis of some of the alternative adjustments available to or being made by farmers of the area. Because of the amount of detail involved, all budgets are shown in summary form. For the benefit of persons interested in the details of the budgeting procedure, a complete budget is included in the Appendix.

Optimum acreages as set up in a previous section of this bulletin, rather than the more common sizes of farms, are used as a point of departure because there was a better adjustment between land resources and power and equipment on the farms using horse power than there was on the tractor operated farms. This is believed to be due to the fairly recent introduction of tractor power into the area and to the lag in the adjustment in size of farms that usually accompanies rapid changes in the size of power and equipment units. The optimum acreages as given for the different sizes of power and equipment units more nearly represent the capacities of these units than do the more common sizes of farms on which these units were being used at the time this study was made.

For the sake of simplicity, the main part of the discussion dealing with adjustments is centered around a farm unit which can be operated by the average farm family using one set of two-row tractor-drawn equipment. This size of power and equipment unit was the most common and was increasing rapidly at the time the study was made. The relation of size

of farm to the various alternatives open to farmers of the area is treated in a subsequent section.

Furthermore, normal production and production requirements for farms on the heavy dark upland soils are used in this analysis. The conclusions apply particularly to farms on these soils. Modification of the conclusions to fit farms on other soil groups should be based on the differences as brought out in the foregoing analysis of the relation of soil resources to differences in organization and operation, and in turn to differences in farm incomes.

Farmers in the area generally follow one of two main cropping systems; one consisting entirely of row-crops, and the other a combination of small grain and row crops. Because of the restrictions of the AAA program, the cropping system which has been followed in the past tends to set up limits within which adjustments in systems of farming may take place.

A committee of farmers in Jones County was consulted in regard to the problems involved in the adjustment of agriculture within the restrictions of the Agricultural Adjustment Administration program. This committee also reviewed the basic information and assumptions used as a basis for this analysis. It was the opinion of this committee that in addition to increasing the size of the farm unit the two principal alternatives open to the majority of farmers in the area were the feeding of beef cattle and the summer fallowing of the non-depleting acreage not needed for the production of forage sorghum and sudan pasture for livestock. It was also the opinion of the committee that other livestock enterprises, such as dairy cattle, poultry, and swine, should not be expanded from present numbers as a general practice. In view of changing demands, however, operators of some farms may find that such enterprises may be fitted into their systems of farming more easily and successfully than cattle feeding. For these reasons and because of the possibilities of growing into these enterprises rather than going into them, dairy cattle and poultry are included in the analysis as two of the principal alternatives open to farmers of the area.

In order to appraise the alternatives open to farmers under the present Agricultural Adjustment Administration program certain assumptions were necessary. First, it was assumed that operators of the farm in question would plant all of, but not exceed, the farm allotments. Secondly, it was assumed that the soil building allowances on these farms would be earned by contouring, since this was the common practice on the heavy dark upland soils. In the following budgets all cropland was assumed to be contoured and the input and output data for contoured land were used in estimating the probable effect on earnings of inclusion of the various alternatives in a system of farming.

In the case of cattle feeding, it was assumed that the size of the enterprise would be determined by the amount of feed which would be available for this purpose on the individual farm. Labor would not be a limiting factor. The acreage of cropland which must be devoted to neutral

or non-depleting crops would be utilized to provide forage and pasture. The more efficient feeders might find it profitable to expand feeding operations beyond this limit through the purchase of surplus grain from other farmers. In the case of summer fallowing the non-depleting acreage, it was assumed that the surplus of milo grain would be disposed of on the cash market.

In the past, about two-thirds of the cropland normally was planted to cotton. The program of the Agricultural Adjustment Administration, however, permits a cotton allotment for each farm which is a fixed percentage of the cropland in the farm. This percentage is uniform for the farms of a county, but varies somewhat from one county to another and from year to year in the same county. In Jones County, this allotment in 1940 amounted to 38.5 per cent of the cropland, excluding the acreage normally devoted to the commercial production of wheat.

Each county is also given a general allotment which consists largely of feed crops which are classified as soil depleting. In Jones County, this allotment in 1940 amounted to 30.81 per cent of the cropland. Farms on which wheat was usually grown in the past are also given a special allotment for wheat. In 1940, this allotment for the county amounted to about 53 per cent of the normal wheat acreage, but on individual farms which were considered to be particularly suited to the production of wheat this allotment could be increased to approximately 66 per cent. In no instance, however, could the total soil depleting allotments exceed 80 per cent of the cropland in the farm. The balance of the cropland must be devoted to crops classified as non-depleting or soil building. Cultivated fallow, sweet sorghum for hay or forage, sudan pasture, and small grain pasture are among the crops or practices listed as neutral or non-depleting.

In all of the budgets, it is assumed that, in addition to the labor of the operator, family labor equivalent to two-thirds of the operator's labor is also available. Any labor required above this is assumed to be hired labor. Since cotton is harvested principally by contract labor, it is assumed that all labor to harvest cotton would be hired. It is estimated that there will be a reduction of sixteen and two-thirds per cent in the time available for field work per month due to weather conditions, holidays, and sickness.

Alternatives on Row-crop Farms

The budget summaries in Table 42 show the estimated effect on income assuming the adoption of the five principal alternatives open to farmers of this area who have followed a row-crop system of farming in the past. A budget summary based on the optimum acreage of cropland which can be handled by a farm family using one set of two-row tractor-drawn equipment and assuming no AAA program is also included for comparison.

Table 42. Budget summaries of alternative systems of farming for farms using two-row tractor equipment and having a row-crop history

Items	No AAA program	Alternatives under AAA				
		Summer fallow	Increased acreage	Beef cattle	Dairy cattle	Poultry
	Acres	Acres	Acres	Acres	Acres	Acres
Total land in farm	250	250	340	250	250	250
Native pasture	45	45	65	45	45	45
Farmstead	5	5	5	5	5	5
Cropland	200	200	270	200	200	200
Amount of cropland in:						
Cotton	130	77	104	77	77	77
Milo	57	62	83	62	62	62
Forage sorghum	7	7	7	20	20	7
Sudan pasture	6	6	6	16	16	6
Summer fallow	----	48	70	----	----	48
Small grain pasture	----	----	----	25	25	----
	No.	No.	No.	No.	No.	No.
Livestock:						
Workstock	2	2	2	2	2	2
Dairy cows	4	4	4	4	15	4
Poultry	100	100	100	100	100	650
Swine	2	2	2	2	2	2
Beef calves	----	----	----	35	----	----
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Total farm investment	10,940	10,940	14,132	12,267	11,730	11,670
Land	8,868	8,868	12,060	8,868	8,868	8,868
Improvements (less residence)	360	360	360	500	480	765
Machinery and equipment	1,303	1,303	1,303	1,533	1,533	1,303
Livestock	409	409	409	1,366	849	734
Total farm sales	2,603	1,877	2,473	3,914	2,402	2,870
Crops	2,319	1,593	2,189	1,116	1,535	1,401
Livestock and livestock products	284	284	284	2,798	867	1,469
Total farm expense	1,157	822	1,002	2,374	932	1,095
Crop expense	309	185	247	199	200	184
Livestock expense	61	61	61	1,546	117	309
Hired labor	459	265	327	266	283	265
Improvement expense	16	16	16	23	22	36
Machinery and equipment expense	230	213	245	248	222	213
Taxes	82	82	106	92	88	88
Total farm sales	2,603	1,877	2,473	3,914	2,402	2,870
AAA payments	----	407	550	407	407	407
Livestock products used in home	166	166	166	166	166	166
Garden	20	20	20	20	20	20
GROSS FARM INCOME	2,789	2,470	3,209	4,507	2,995	3,463
Total farm expense	1,157	822	1,002	2,374	932	1,095
Unpaid family labor	126	118	133	147	222	196
Depreciation	306	306	306	355	323	342
TOTAL DEDUCTIONS	1,589	1,246	1,441	2,876	1,477	1,633
Return to capital and operator's labor and management	1,200	1,224	1,768	1,631	1,518	1,830
Interest on investment at 6 per cent	656	656	848	736	704	700
Labor and management wage	544	568	920	895	814	1,130

The alternative which requires the least change in the present system of farming and also the least effort on the part of the operator is the summer fallowing of the restricted acreage not needed for the production of forage and pasture for the present numbers of livestock. By a comparison with the organization shown in column 1 of this table, some

measure may be obtained of the extent to which the operator following the fallow system fails to make the optimum use of his resources. A more complete utilization of his resources may be obtained through recourse to any one of the other four alternatives. Here the choice lies between increasing the acreage in the farm to the optimum amount that can be handled under the fallow system or the intensification of his system of farming on the present acreage through the inclusion of one or more livestock enterprises. Assuming that land is available, increasing the size of farm is particularly attractive to farmers of this area for the reason that they may make reasonably complete use of their operating capital without the necessity of materially changing their system of farming or having to learn the techniques involved in new enterprises. This may explain the tendency during recent years of farmers in this area to resort to this alternative almost to the exclusion of all others.

To the man who is unable to increase his acreage, however, the choice of alternatives lies between summer fallow on one hand and some type of livestock system on the other. The dairy and poultry enterprises have an advantage over the feeding of beef cattle in that most farmers already have some knowledge of the problems involved in the management of these livestock enterprises. Also, the dairy and poultry enterprise may be increased gradually as knowledge of improved practices is gained. The beef feeding enterprise has the advantage of a type of flexibility, however, not found in the dairy enterprise. There is a complete turnover in the beef feeding enterprise each year. This permits an annual adjustment to fit available feed supplies and the price outlook for beef. It should be recognized that the poultry enterprise utilizes practically no roughage, but requires large amounts of grain and labor. This permits the expansion of the poultry enterprise on the farm following the summer fallow system without changing the cropping system. It may also be included in other systems of farming to the extent that labor and surplus grain are available.

There would also be differences in the problem of financing the alternative adjustments. The significance of these differences would vary depending upon the situation of the individual operator. If land is available it may be leased and the adjustment to increased acreage may be made without additional investment of capital on the part of the operator. The problem of financing the purchase of feeder cattle may be more difficult than would be the financing of a gradual expansion of the dairy or poultry enterprise. Another conditioning factor is the tenure of the operator. Generally speaking, owner-operators have more freedom of choice than do the tenants who are dependent on the cooperation of their landlords in making adjustments to a more complex system of farming. Furthermore, landowners generally have less difficulty in financing adjustments than do tenants.

The estimated income from a fallow system on the present acreage is substantially less than from any of the other four alternatives. It

is estimated that under the conditions of prices and costs that existed in 1938 this system would produce a labor and management wage of $568 as compared with a labor and management wage from the other systems ranging from $814 in the case of dairy cattle to $1,130 in the case of the poultry alternative. The differences in the estimated earnings as between the latter alternatives are not so great but that the choice of an alternative may well be determined by one of the factors or conditions mentioned above. Such differences as exist may easily be overcome through improvements in production practices as for example the feeding of better balanced rations to dairy cattle to improve the production per cow.

Alternatives on Cotton-Small Grain Farms

The estimated effect on incomes of the five principal alternatives open to farmers in the area who have followed a cotton-small grain system of farming in the past are presented in Table 43. As was pointed out in the section dealing with optimum acreages, custom harvesting of small grain permits the addition of a certain amount of small grain to the cropping system without a reduction of the acreage in row crops. The resultant larger size of the farm unit is reflected in the higher expected farm earnings for the various alternatives than for the same alternatives under a row-crop system. Also, the relative advantage or disadvantage of the different alternatives with respect to each other are somewhat changed. The estimated labor and management wage ranges from $802 in the case of the fallow system to $1,395 in the case of the poultry alternative. This level of earnings is approximately $275 above the level of earnings for the same alternatives on row-crop farms.

The beef cattle alternative is relatively much more advantageous on cotton-small grain farms than on row-crop farms as operated under the restrictions of the AAA program. The relatively larger feed production permitted on cotton-small grain farms enables the operator to maintain a somewhat larger beef cattle enterprise without a significant increase in the total overhead costs. The lower overhead costs per animal results in a substantial increase in the net returns from the enterprise.

In the case of the dairy cattle and poultry alternatives, the limiting factor was labor rather than feed. These two alternatives have practically the same relative advantage with either cropping system.

The advantage of increasing the acreage is not so great on cotton-small grain farms as on row-crop farms. This is owing to the fact that the increase in acreage is relatively less on cotton-small grain farms than on row-crop farms. This in turn is due to the peculiar manner in which the restriction of the AAA program affects acreages of the different crops in the two cropping systems.

An analysis was made of these same alternatives for cotton-small grain farms assuming ownership on the part of the operator of grain harvesting equipment. In addition to increasing the total overhead costs

Table 43. Budget summaries of alternative systems of farming for farms using two-row tractor equipment and having a cotton-small grain history

Items	No AAA program	Alternatives under AAA				
		Summer fallow	Increased acreage	Beef cattle	Dairy cattle	Poultry
	Acres	Acres	Acres	Acres	Acres	Acres
Total land in farm	325	325	385	325	325	325
Native pasture	60	60	70	60	60	60
Farmstead	5	5	5	5	5	5
Cropland	260	260	310	260	260	260
Amount of cropland in:						
Cotton	130	77	92	77	77	77
Wheat	60	39	47	39	39	39
Milo	57	80	95	80	80	80
Forage sorghum	7	7	7	25	23	7
Sudan pasture	6	6	6	20	16	6
Summer fallow	----	51	63	----	----	51
Small grain pasture	----	----	----	19	25	----
	No.	No.	No.	No.	No.	No.
Livestock:						
Workstock	2	2	2	2	2	2
Dairy cows	4	4	4	4	15	4
Poultry	100	100	100	100	100	650
Swine	2	2	2	2	2	2
Beef calves	----	----	----	50	----	----
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Total farm investment	13,680	13,680	15,808	15,345	14,390	14,410
Land	11,528	11,528	13,656	11,528	11,528	11,528
Improvements (less residence)	360	360	360	500	480	765
Machinery and equipment	1,383	1,383	1,383	1,533	1,533	1,383
Livestock	409	409	409	1,784	849	734
Total farm sales	3,014	2,317	2,735	5,283	2,833	3,311
Crops	2,730	2,033	2,451	1,376	1,967	1,842
Livestock and livestock products	284	284	284	3,907	866	1,469
Total farm expense	1,289	931	1,079	3,125	1,040	1,205
Crop expense	399	243	290	251	250	243
Livestock expense	61	61	61	2,183	117	309
Hired labor	461	272	384	275	302	272
Improvement expense	16	16	16	23	22	36
Machinery and equipment expense	249	236	259	278	241	236
Taxes	103	103	119	115	108	108
Total farm sales	3,014	2,317	2,735	5,283	2,833	2,311
AAA payments	----	492	588	493	492	492
Livestock products used in home	166	166	166	166	166	166
Garden	20	20	20	20	20	20
GROSS FARM INCOME	3,200	2,995	3,509	5,962	3,511	3,989
Total farm expense	1,289	931	1,079	3,125	1,040	1,205
Unpaid family labor	130	129	140	176	205	176
Depreciation	319	312	312	355	323	349
TOTAL DEDUCTIONS	1,738	1,372	1,531	3,656	1,568	1,730
Return to capital and operator's labor and management	1,462	1,623	1,978	2,306	1,943	2,259
Interest on investment at 6 per cent	821	821	948	921	863	864
Labor and management wage	641	802	1,030	1,385	1,080	1,395

and reducing the cash costs of operation, the only significant effect of the ownership of harvesting machinery is in its effect on the relative proportion of the various crops making up the cropping system. The

cropland organization and the labor and management wage are shown for the various alternatives in Table 44. These may be compared with

Table 44. Cropland organization and estimated earning for alternative systems on cotton-small grain farms, assuming ownership of grain harvesting machinery

Items	No AAA program	Alternatives under AAA				
		Summer fallow	Increased acreage	Beef cattle	Dairy cattle	Poultry
Cropland	260	260	310	260	260	260
Amount of cropland in:						
Cotton	90	62	74	62	62	62
Wheat	100	66	78	66	66	66
Milo	57	80	95	80	80	80
Forage sorghum	7	7	7	25	20	7
Sudan pasture	6	6	6	20	16	6
Summer fallow	----	39	50	----	----	39
Small grain pasture	----	----	----	7	16	----
Labor and management wage	551	768	1,004	1,356	1,053	1,360

the same items in Table 43. It will be noted that in each case the acreage in cotton and fallow, or small grain pasture, is reduced, while the acreage in wheat is increased by an amount equivalent to the sum of these reductions. The difference in earnings, although favoring the practice of custom harvesting in all cases, is too small to be significant. Therefore the choice between the two systems of harvesting will be determined very largely by the value placed by the operator on the greater control over harvesting operations obtained through the ownership of grain harvesting equipment.

Effect of Size of Farm and Variation in Prices on Farm Income and on the Relative Advantage of Alternative Systems of Farming

The foregoing analysis was limited to a size of farm that could be handled by an average farm family using one set of two-row tractor-drawn equipment and to prices and costs as they prevailed during 1938. It remains to consider the effect of differences in price relationships on the estimated earnings for different sizes of farms and systems of farming. A summary of the earnings as measured by the operator's labor and management wage on 35 different sizes and systems of farming under five sets of price relationships is presented in Table 45. The conclusions drawn from the effect of size of farm on farm earnings in the area in 1935 are borne out in this analysis. Generally speaking, farm income increased with size of farm. The advantage of larger size tends to be greater during periods of relatively high prices and is greatly reduced during periods of relatively low farm prices, such as occured during the period 1931-1933 and again during 1938. For example, the estimated labor and management wage for an optimum acreage for one-row

Table 45. Estimated earnings from various sizes of farms and systems of farming as affected by variations in price

Type of farm	Expected earnings[1] under price conditions of:				
	1927–1935	1927–1929	1931–1933	1934–1936	1938
	Dollars	Dollars	Dollars	Dollars	Dollars
One-row horse-drawn equipment:					
Row-crop system of farming—No AAA program	453	889	-9	455	100
Cotton-small grain system—No AAA program	634	1,217	28	663	208
Two-row horse-drawn equipment:					
Row-crop system of farming—No AAA program	1,041	1,922	85	1,069	323
Alternatives under AAA program:					
Summer fallow	901	1,537	176	943	433
Increased acreage	1,207	1,976	308	1,298	628
Beef cattle	1,019	1,680	195	1,053	511
Dairy cattle	1,040	1,784	236	1,010	573
Poultry	1,254	2,034	475	1,182	728
Cotton-small grain system of farming—No AAA program	1,237	2,247	119	1,274	427
Alternatives under AAA program:					
Summer fallow	1,143	1,886	256	1,233	612
Increased acreage	1,335	2,159	339	1,454	737
Beef cattle	1,420	2,218	360	1,496	822
Dairy cattle	1,299	2,149	398	1,316	767
Poultry	1,497	2,383	555	1,471	906
Two-row tractor-drawn equipment:					
Row-crop system of farming—No AAA program	1,497	2,668	157	1,625	544
Alternatives under AAA program:					
Summer fallow	1,153	1,952	194	1,272	568
Increased acreage	1,657	2,693	392	1,856	920
Beef cattle	1,551	2,455	382	1,646	895
Dairy cattle	1,399	2,393	301	1,386	814
Poultry	1,823	2,891	638	1,730	1,130
Cotton-small grain system—No AAA program	1,721	3,070	158	1,862	641
Alternatives under AAA program:					
Summer fallow	1,480	2,432	290	1,665	802
Increased acreage	1,838	2,951	432	2,079	1,030
Beef cattle	2,167	3,287	648	2,326	1,385
Dairy cattle	1,758	2,907	422	1,809	1,080
Poultry	2,181	3,408	753	2,153	1,395
Alternative small grain system—No AAA program	1,435	2,661	6	1,566	551
Alternatives under AAA program:					
Summer fallow	1,398	2,354	207	1,582	768
Increased acreage	1,752	2,864	350	1,991	1,004
Beef cattle	2,091	3,217	568	2,249	1,356
Dairy cattle	1,685	2,844	408	1,736	1,053
Poultry	2,099	3,330	736	2,070	1,360
Four-row tractor-drawn equipment:					
Row-crop system—No AAA program	3,035	5,098	568	3,410	1,361
Cotton-small grain system—No AAA program	3,275	5,533	566	3,664	1,464
Alternative small grain system—No AAA program	2,703	4,674	301	3,071	1,250

[1]Operator's labor and management wage.

horse-drawn equipment and following a row-crop system of farming was $100 under 1938 price conditions. Similarly, the estimated earnings for optimum two-row horse, two-row tractor, and four-row tractor-drawn units were $323, $544, and $1,361. Under the price relationships which prevailed during 1927-1929, the estimated earnings for these same units were $889, $1,922, $2,628, and $5,098. It will be noted from these comparisons that the estimated earnings from an optimum unit for four-row tractor equipment were approximately 50 per cent greater assuming

1938 prices than were the earnings from an optimum unit for one-row horse-drawn equipment assuming the high prices of 1927-1929.

In addition to resulting in a wide range of earnings as between price periods, the principal effect of a wide range of price conditions is to change the relative advantage of the different systems of farming. For example, during the period 1934-1935 prices of feed crops and cotton were relatively high in comparison to the prices of livestock products. The relative advantage of the livestock alternatives was not so great as it was during 1938 when the prices of livestock products were relatively high as compared with the prices of other farm products.

The relative advantage of participation in the AAA program is also affected by the level of prices. The relative advantage of participation is much greater during periods of low prices such as those of 1931-1933 and 1938 than it is during periods of high prices such as those that prevailed during 1927-1929. With the possible exception of summer fallow, however, the earnings of all alternatives compare favorably with the earnings of the optimum unit, assuming no AAA program. Apparently the disadvantage of smaller production under the AAA program was at least offset by the benefit payments as computed under the regulations of the 1940 program. These payments for an optimum two-row tractor unit were estimated to range from $400 to $500 under the various alternatives.

The differences in the relative advantage of the various alternatives as affected by the wide range of price situations were not so great in any instance but that they could easily be overcome by improved production practices. This analysis suggests that, other than increasing the size of the farm, the best opportunities for increasing farm income may be found in the improvement of production practices. Assuming a system of farming reasonably well adapted to the resources of the area, a systematic program for the improvement of production methods would add considerably more to the operator's income over a period of years than could be obtained through modification of the organization of the farm. For example, the average annual production of dairy cows on the farms studied was 160 pounds of butterfat per cow. An interested operator could easily raise the level of production to at least 250 pounds of butterfat per cow through somewhat closer attention to feeding and breeding problems. Such an improvement in dairy practices for a fifteen cow dairy herd would result in increases in income over and above additional feed costs of $205 assuming average prices for feed and dairy products which prevailed during the period 1927-1935. The increases under the other price assumptions would range from $114 for the period of 1934-1935 when feed prices were relatively high to $328 for the period 1927-1929, a period of generally high prices. The low level of egg production in the poultry flocks in the area suggests that a similar opportunity is offered in connection with that enterprise. Livestock enterprises by no means offer the only opportunity for improvement of production practices. Keeping up with the latest improvements in the

selection and care of seed, the latest developments in methods of controlling insects and plant diseases, and the application of the best known practices for the conservation of moisture and for the maintenance and improvement of soils and soil fertility represent ways of making significant additions to the operator's income.

Conservation Practices

Two of the more common practices aimed at the conservation of soil and moisture by farmers of the area are terracing and contour cultivation. On the farms studied, approximately 11 per cent of the cropland was terraced and an additional 43 per cent was farmed on the contour. On the dark heavy upland soils, the normal cotton yields on terraced land were estimated to be 15 pounds, or 10 per cent, more than yields on untreated land, while the difference in cotton yields owing to contour cultivation was estimated to be approximately 7 per cent. (See Table 18.) Yield differences owing to these practices as estimated for other crops ranged from 10 to 50 per cent, depending on the crop and the conservation practice. Labor and machinery requirements on operations for which field machinery is required were estimated to be approximately 9 per cent greater for terraced and contoured fields as compared with fields in which straight row practices were followed. The following analysis is an attempt to measure the effect of these differences on farm income.

The estimated labor and management wage as affected by conservation practices under five sets of price relationships is shown in Table 46. The price relationships most advantageous to terracing were the rela-

Table 46. Effect of conservation practices on farm income[1] on farms with row-crop system of farming and two-row tractor-drawn equipment

Price periods	Conservation measures		
	No practices	Terraced	Contoured
	Dollars	Dollars	Dollars
1927–1935	1,318	1,517	1,497
1927–1929	2,416	2,728	2,668
1931–1933	71	123	157
1934–1935	1,423	1,660	1,625
1938	425	532	544

[1]Operator's labor and management wage.

tively high prices of the period 1927-1929. In a period of very low prices such as 1931-1933, the expected returns are higher on contoured land than on terraced land. Under the price relationships of 1934-1935, which somewhat approach average conditions, the advantage of terracing over contouring is slight. In a period in which cotton prices are low in comparison to prices of other products such as in 1938, the expected returns again favor contouring over terracing.

Terracing also has certain disadvantages which are not associated with contouring. A larger investment is necessary because of the cost of constructing terraces and, in addition, extra labor and expense are incurred in maintaining the terraces. In years of heavy rainfall, crops on terraced land are more subject to damage from excessive moisture.

Undoubtedly, the above mentioned considerations have influenced the farmers in the area in their adoption of conservation practices. This is substantiated in part by the fact that in 1936 fifty-five per cent of the cropland on the heavy dark upland soils was contoured, while only 12 per cent was terraced.

The use of conservation practices apparently is profitable for farms on the heavy dark upland soils, but the results obtained on idividual farms and on farms on other soil types may vary widely from the results shown. Careful consideration should be given to differences in the resources of a farm before adopting one practice or the other. By a careful study of the results obtained on other farms with resources similar to theirs, farm operators should be able to better plan the practice or practices suited to their farms.

SUMMARY

The Rolling Plains Area of Texas, located in the northwestern part of the State, consists of all of 19 counties and parts of 24 others. That portion of the area known as sub-area 4c comprises more than one-third of the whole. Previous to 1900, the area was utilized principally for cattle ranching. The shift from ranching to farming which began slowly between 1880 and 1890 was most rapid between 1900 and 1910 and continued steadily until 1929 when a peak of 1,584,000 acres of crops were harvested in six counties (Coleman, Runnels, Taylor, Fisher, Haskell, and Jones) lying entirely within sub-area 4c. Since 1929, there has been a decrease of 15 per cent in the amount of cropland. According to the U. S. Census of Agriculture, 93.5 per cent of the total land in these six counties was in farms in 1939, and 41 per cent of the farm land was in crops. Since 1900 cotton has consistently been the leading cash crop, while small grains and grain sorghums have been supplementary although irregular sources of income. The grain sorghums superseded corn as the principal feed crop shortly after their introduction between 1900 and 1910.

The rural population of the above six counties reached its peak of 103,225 about 1910, receded to 88,000 in 1920 as a result of extreme drought, and returned to 100,000 in 1930. However, by 1940 it had again receded to 89,000, largely in response to reductions in cotton acreage and to a shift from one-row horse-drawn to multi-row tractor-drawn machinery.

In order to make a careful appraisal of the alternative systems of farming available to farmers in the area, certain data were obtained on 200 representative farms in Jones County. This county, in turn, is rep-

resentative of a large portion of the Rolling Plains, but more particularly of sub-area 4c. The data obtained include detailed information pertaining to soils, soil erosion, conservation needs and practices, farm organization, farm income, production, production requirements, and production practices.

Seventeen soil types were identified on the 200 farms mapped. For purposes of relating soils to other factors these soil types were classed into five groups as follows: heavy dark upland soils, heavy reddish upland soils, sandy upland soils, bottomland soils, and shallow broken land. The heavy dark upland soils are predominant making up almost 60 per cent of the soils on the farms studied and about 35 per cent of the soils of the county.

Eighty-five per cent of all soils on the farms studied had slopes of less than 1 per cent. In this respect the five groups ranged as follows: bottom lands, 99 per cent; heavy dark upland soils, 95 per cent; heavy reddish upland soils, 75 per cent; sandy upland soils 56 per cent; and shallow broken land, 36 per cent.

Closely related to slope are erosion conditions. Less than 10 per cent of all soils were classed as moderately to severely eroded, while 1.5 per cent of bottomland soils, 3.2 per cent of heavy dark upland soils, 16.8 per cent of sandy upland soils, 19.4 per cent of heavy reddish upland soils, and 43.5 per cent of shallow broken land were so classed. Gullies were reported on only 4.5 per cent of the cropland having less than 1 per cent slope, whereas gullies were noted on 27.6 per cent and on 63 per cent of the lands having slopes of 1—4 per cent and 4 per cent and over.

The climate is typically subhumid. The rainfall which averages 24 inches per year varies greatly in amount from year to year and in its distribution within the year.

Of the total cropland on the farms studied, 11 per cent was terraced and 43 per cent was contoured. It was estimated that these practices reduce erosion 69 and 33 per cent and run-off water 68 and 41 per cent.

The increases in yields resulting from moisture conservation ranged from 8 per cent on cotton to about 25 per cent on feed crops in the case of terracing, while contouring affected yields by approximately one-half of these amounts.

Ten per cent more labor and power is required to produce crops on contoured and terraced land as compared with straight row cultivation.

A hundred sixty acre farm was the most common size on all soil types in Jones County in 1938.

Generally speaking, row-crop farms were more common than cotton and wheat farms. On the heavy upland soils 58 per cent were cotton farms and 42 per cent cotton-wheat farms; on sandy upland soils 82 per cent were cotton farms and 18 per cent cotton-wheat farms; on bottom lands 53 per cent were cotton farms and 47 per cent cotton-wheat farms; on shallow broken lands 36 per cent were cotton farms and 64 per cent cotton-wheat farms. On the shinnery sands 86 per cent of the farms grew

peanuts and feed crops, while 14 per cent grew cotton and none grew wheat.

The average labor and management wage of farm operators on heavy dark upland soils in 1935 was $1,009 as compared with $730, $647, and $526 for operators on heavy reddish upland, sandy upland, and bottomland soils.

Three factors accounted for 40 per cent of the variation in earnings of 100 farm operators on heavy dark upland soils in 1935. These factors and the percentage of the difference in earnings accounted for by each were as follows: differences in crop yields, 21 per cent; differences in size of farm, 15 per cent; and differences in cropping systems, 4 per cent.

Normal rates of production, normal requirements of seed and materials and normal requirements of labor and power assuming the various types of power and sizes of machines commonly used are given for each important crop. The usual period of performance of each crop operation and the distribution by months of total labor requirements of each crop are also given.

The keenest competition for labor occurs during June in the cultivation of row crops and the harvesting of small grains and during September, October, and November in the harvesting of cotton and forage sorghums and in the seeding of small grain. Milo is usually harvested in August just ahead of cotton harvesting but competes to a certain extent with land preparation for small grains.

The average rates of production and the usual requirements for production are given for each class of produce livestock.

Livestock and livestock products grown and consumed by 197 farm families averaged 507 gallons of milk, 79 pounds of butter, 172 dozens of eggs, 56 head of poultry, 544 pounds of pork, and 61 pounds of beef.

The average cost of maintaining a work animal on 34 farms was 67 cents per day worked or $3.00 per acre in crops. The cost of maintaining a two-row tractor on 54 farms was $4.89 per day of use or $1.74 per acre of cropland.

Optimum crop acreages for an average farm family using one set of one-row horse-drawn machinery and assuming a full cotton acreage were estimated to be 80 acres on row-crop farms and 120 acres on cotton-wheat farms. For two-row horse, two-row tractor, and four-row tractor-drawn equipment the estimated optimum crop acreages were 160, 200, and 380 acres for row-crop farms and 200, 260, and 440 acres for cotton-wheat farms.

Five different sets of prices representing a wide range of prices and price relationships are given. These sets of prices were used to show the probable effect of varying price situations on expected earnings from the various alternative systems of farming open to farmers of the area.

An analysis of alternative systems of farming on the heavy dark upland soils resulted in the following conclusions:

Increasing the size of farm to utilize more fully operating capital and management, after adjustments required by the AAA program, compares favorably with other alternatives from an income standpoint and more especially so on row-crop farms using horse-drawn equipment. This alternative is particularly attractive to farmers of the area for the reason that they make reasonably complete use of their operating capital without the necessity of materially changing their system of farming or having to learn the techniques involved in new enterprises.

In cases where additional land cannot be obtained, a system of farming involving more than the usual amount of livestock production is indicated. The choice as between the alternative livestock systems would largely turn on factors other than incomes since differences in estimated incomes were not so great but that they could easily be offset by improvements in production practices. The dairy and poultry enterprises have same advantage over the feeding of beef cattle in that most farmers already have some knowledge of these enterprises and, furthermore, they lend themselves to gradual expansion as knowledge of improved practices is gained. On the other hand the beef feeding enterprise has the advantage of year-to-year flexibility over dairying. There is a complete turn-over in the beef feeding enterprise each year. This permits an annual adjustment to fit available feed supplies and the price outlook for beef. The beef feeding system seems to be most advantageous on farms having a cotton-small grain cropping system.

Custom harvesting of small grains has a slight income advantage over the ownership of grain harvesting equipment. This difference may be offset, however, by the advantage of greater control over harvesting operations obtained through ownership of the equipment.

Generally speaking, farm income increases with size of farm. The advantage of larger size tends to increase during periods of relatively high prices and is greatly reduced during periods of relatively low prices such as prevailed during the period 1931-1933 and again in 1938. For example, the difference in estimated earnings on row-crop farms using one set of one-row horse-drawn machinery between the period of highest prices, 1927-1929, and the period of lowest prices, 1931-1933, was less than $900. The differences as between the same periods were $1,800, $2,500, and $4,500 for row-crop farms using one set of two-row horse, two-row tractor, and four-row tractor-drawn machinery.

It was estimated that contouring or terracing on the heavy dark lands would increase earnings on row-crop farms using one set of two-row tractor-drawn equipment by approximately $200 per year assuming average prices of the period 1927-1935. As between the two practices, there was no significant difference except that during periods of high prices terracing would have a slight advantage, while during periods of low prices contouring would have the advantage. This probably explains farmer preference for the more simple practice of contouring.

APPENDIX

A complete budget with all details shown is included for the benefit of those persons desiring information as to budgeting procedure.

Detailed information on labor and power requirements for crop production including for each operation and for different sizes and types of power units, the size and type of tool, the unit crew, the acres covered per ten-hour day, the times over, and the hours per acre is presented.

Table 47. Detailed budget for farm using one-row horse-drawn equipment with row-crop system of farming

Section A. Labor requirements and cash expenses for crops

Crop	Acres	Man hours	Horse hours	Seed		Other expenses	
				Amount	Cost	Amount	Cost
Cotton	50	1,573	1,184	24 bushels	$ ----	Ginning, bagging, and ties	$110.27
Milo	19	280	484	5 bushels	8.00	----------	------
Grain sorghum forage	6	98	147	38 lbs.	----	----------	------
				40 lbs.	----	Binder twine, 20 lbs.	1.86
Sudan pasture	5	32	70	40 lbs.	2.00	----------	------
Farmstead	5	---	---	--------	----	----------	------
Native pasture	15	---	---	--------	----	----------	------
Total	100	1,983	1,885		$10.00		$112.13

Section B. Production and disposal of crops

Crop	Production	Farm use		Sales	
		Feed	Seed	Amount	Value
Cotton:					
Lint	7,850 lbs.	--------	------	7,850 lbs.	$ 907.46
Seed	12,733 lbs.	438 lbs.	768 lbs.	11,527 lbs.	140.05
Snapped cotton	30,090 lbs.	--------	------	--------	------
Milo grain	21,052 lbs.	14,763 lbs.	38 lbs.	6,251 lbs.	56.26
Grain sorghum bundles	25,014 lbs.	25,014 lbs.	------	--------	------
Total					$1,103.77

Table 47. Detailed budget for farm using one-row horse-drawn equipment with row-crop system of farming—Continued

Section C. Feed and other expenses for livestock

Livestock	No.	Man hours	Home grown feeds		Purchased feeds			Other	
			Kind	Quantity	Kind	Quantity	Cost	Kind	Cost
Workstock	3	180	Milo grain	10,242 lbs.	----------	----	$ ----	Miscellaneous	$ 2.00
			Sorghum bundles	15,110 lbs.	----------	----	----	----------	----
Cows	2	302	Cottonseed	438 lbs.	Cottonseed meal	525 lbs.	7.88	Miscellaneous	2.00
			Milo grain	728 lbs.					
			Sorghum bundles	9,904 lbs.					
Poultry	50	140	Milo grain	2,050 lbs.	Bran	330 lbs.	4.45	50 baby chicks	4.85
			Skim milk	1,545 lbs.	Shorts	250 lbs.	4.12	----------	----
					Laying mash	190 lbs.	4.08	----------	----
					Chick starter	70 lbs.	1.96	----------	----
					Growing mash	50 lbs.	1.20	----------	----
Swine	2	45	Milo grain	1,743 lbs.	----------	----	----	----------	----
			Skim milk	1,521 lbs.	----------	----	----	2 weaning pigs	7.00
Total		637					$23.69		$15.85

Section D. Production and disposal of livestoek and livestock products

Livestock	Production	Fed to livestock	Used in home		Sales	
			Amount	Value	Amount	Value
Cows	320 lbs. butterfat	------	270 lbs.	$ 70.20	50 lbs.	$ 13.00
	600 lbs. veal	------	300 lbs.	15.00	300 lbs.	15.00
	3,066 lbs. skim milk	3,066 lbs.	------	-----	------	-----
Poultry	458 doz. eggs	6 doz.[1]	172 doz.	34.40	280 doz.	56.00
	94 lbs. fryers	------	94 lbs.	20.68	------	-----
	60 lbs hens	------	25 lbs.	3.50	35 lbs.	4.90
Swine	400 lbs pork	------	400 lbs.	26.00	------	-----
Total				$170.38		$ 88.90

[1]Eggs used in hatching for replacement.

Table 47. Detailed budget for farm using one-row horse-drawn equipment with row-crop system of farming—Continued

Section E. Summary of receipts and expenses

Items	Total Value
Farm investment—Total	$4,495.00
Investment in:	
Land	3,547.00
Improvements (less residence)	166.00
Machinery and equipment	370.00
Livestock	412.00
Farm sales—Total	1,192.67
Amount of sales from:	
Crops (Section B.)	1,103.77
Livestock and livestock products (Section D.)	88.90
Farm expense—Total	408.77
Amount of expense for:	
Crops (Section A.)—	
Seed	10.00
Other expenses	112.13
Livestock (Section C.)—	
Feed purchased	23.69
Other expenses	15.85
Hired labor—	
Snapping cotton (30,090 lbs. at $0.45 cwt.)	135.40
Other (82 hours)	10.25
Other expenses:	
Improvement expense	10.88
Machinery and equipment expense	56.75
Taxes	33.82
Total farm sales	1,192.67
Livestock products used in home	170.38
Garden	20.00
GROSS FARM INCOME	1,383.05
Total farm expense	408.77
Unpaid farmily labor (712 hours)	89.00
Depreciation:	
Improvements	19.58
Machinery and equipment	92.25
Workstock	50.00
TOTAL DEDUCTIONS	659.60
Return to capital and operator's labor and management	723.45
Interest on investment at 6 per cent	269.70
Labor and management wage	453.75

Table 48a. Labor and power required per acre for the usual operations in growing and harvesting cotton on farms using one-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	1 R	1	2	8.5	.34	.41	.82
Flat break	2 disc	1	4	4	.19	.48	1.92
	Breaking plow						
List	1–14″ point	1	4	8	.37	.48	1.92
Bed	1–20″ sweep	1	2	8	1.05	1.29	2.59
Knife beds	1 R slide	1	2	8.5	.07	.09	.17
Cultivate beds	4 sweeps	1	2	9	.30	.33	.65
Planting	1–20″ sweep	1	2	7	1.29	1.92	3.84
Machine cultivation:							
Harrow	2 section	1	2	21	.12	.06	.11
Knife	1 R slide	1	2	8.5	.16	.20	.39
Cultivate	4 sweeps	1	2	8	3.38	4.22	8.48
Chop	----------	1	--	3	.74	2.48	----
Hoe	----------	1	--	4	1.11	2.90	----
Poison	6 R spray	2	2	17	.13	.08	.08
Total hours per acre previous to harvest	----------	--	--	----	----	14.94	20.97
Harvest:							
Pick	----------	1	--	----	.28	2.70	----
Snap	----------	1	--	----	1.82	12.27	----
Haul and gin	Wagon	1	2	----	1.00	1.34	2.68
Total harvest	----------	--	--	----	----	16.31	2.68
Total all operations	----------	--	--	----	----	31.25	23.65

Table 48b. Labor and power required per acre for the usual operations in growing and harvesting cotton on farms using two-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	2 R	1	4	20.5	.34	.17	.66
Flat break	2 disc	1	4	4	.19	.48	1.92
Harrow	2 section	1	4	19.5	.11	.06	.22
List	2R–16″ point	1	5	16.5	.37	.23	1.13
Bed	2–20″ sweeps	1	5	15	1.05	.69	3.44
Knife beds	2 R slide	1	4	17	.07	.04	.16
Cultivate beds	8 sweeps	1	4	17	.30	.18	.71
Plant	2–20″ sweeps	1	5	14.5	1.29	.90	4.53
Machine cultivation:							
Harrow	2 section	1	2	21	.12	.06	.11
Knife	2 R slide	1	4	15	.16	.11	.42
Cultivate	8 sweeps	1	4	16	3.38	2.13	8.55
Chop	----------	1	--	3	.74	2.48	----
Hoe	----------	1	--	4	1.11	2.90	----
Poison	6 R spray	2	2	17	.13	.08	.08
Total hours per acre previous to harvest	----------	--	--	----	----	10.51	21.93
Harvest:							
Pick	----------	1	--	----	.28	2.70	----
Snap	----------	--	--	----	1.82	12.27	----
Haul and gin	Wagon	1	2	----	1.00	1.34	2.68
Total harvest	----------	--	--	----	----	16.31	2.68
Total all operations	----------	--	--	----	----	26.82	24.61

Table 48c. Labor and power required per acre for the usual operations in growing and harvesting cotton on farms using two-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Tractor			Man	Tractor
Seed bed preparation:							
Cut stalks	2 R	1	1	26	.34	.13	.13
Flat break	3 disc	1	1	7.5	.19	.25	.25
One-way	6 foot	1	1	18	.18	.09	.09
Harrow	4 section	1	1	75	.11	.01	.01
List	2 R	1	1	21	.37	.18	.18
Bed	2–20″ sweeps	1	1	20	1.05	.52	.52
Knife beds	2 R slide	1	1	20	.07	.03	.03
Cultivate beds	2 R	1	1	24	.30	.13	.13
Plant	2–20″ sweeps	1	1	18.5	1.29	.70	.70
Machine cultivation:							
Harrow	4 section	1	1	63	.12	.02	.02
Knife	2 R slide	1	1	20	.16	.08	.08
Cultivate	3 R	1	1	28	3.38	1.22	1.22
Chop	----------	1	--	3	.74	2.48	----
Hoe	----------	1	--	4	1.11	2.90	----
Poison	6 row spray	2	1	20.5	.13	.06	.03
Total hours per acre previous to harvest	----------	--	--	----	----	8.80	3.39
Harvest:							
Pick	----------	1	--	----	.28	2.70	----
Snap	----------	1	--	----	1.82	12.27	----
Haul and gin	Car and trailer	1	1	----	1.00	1.20	1.20
Total harvest	----------	--	--	----	----	16.17	1.20
Total all operations	----------	--	--	----	----	24.97	4.59

Table 48d. Labor and power required per acre for the usual operations in growing and harvesting cotton on farms using three- and four-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Tractor			Man	Tractor
Seed bed preparation:							
Cut stalks	4 R	1	1	55	.34	.06	.06
One-way	6 foot	1	1	18	.18	.09	.09
Harrow	4 section	1	1	75	.11	.01	.01
Bed	3-20″ sweeps	1	1	30	1.05	.35	.35
Plant	4-20″ sweeps	1	1	33	1.29	.39	.39
Machine cultivation:							
Cultivate	4 R	1	1	38	3.38	.88	.88
Chop	----------	1	--	3	.74	2.48	----
Hoe	----------	1	--	4	1.11	2.90	----
Poison	6 R spray	2	1	20.5	.13	.06	.03
Total hours per acre previous to harvest	----------	--	--	----	----	7.22	1.81
Harvest:							
Pick	----------	--	--	----	.28	2.70	----
Snap	----------	--	--	----	1.82	12.27	----
Haul and gin	Car and trailer	1	1	----	1.00	1.20	1.20
Total harvest	----------	--	--	----	----	16.17	1.20
Total all operations	----------	--	--	----	----	23.39	3.01

Table 49a. Labor and power required per acre for the usual operations in growing and harvesting milo on farms using one-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	1 R	1	2	8.5	.33	.40	.80
Flat break	2 disc	1	4	4	.11	.28	1.11
List	1–14″ point	1	4	8	.26	.34	1.35
Bed	1–20″ sweep	1	2	8	1.01	1.24	2.49
Center furrow	Diamond point	1	2	9	.11	.13	.25
Knife beds	1 R slide	1	2	8.5	.08	.10	.20
Cultivate beds	4 sweeps	1	2	9	.18	.20	.39
Plant	1–20″ sweep	1	2	7	1.07	1.54	3.08
Machine cultivation:							
Harrow	2 section	1	2	21	.13	.06	.12
Knife	1 R slide	1	2	8.5	.14	.17	.34
Cultivate	4 sweeps	1	2	8	2.33	2.91	5.85
Hoe	----------	1	--	3	.75	2.64	----
Total hours per acre previous to harvest	----------	--	--	----	----	10.01	15.98
Harvest:							
Head and haul in	Wagon	1	2	----	1.00	4.50	9.00
Total all operations	----------	--	--	----	----	14.51	24.98

Table 49b. Labor and power required per acre for the usual operations in growing and harvesting milo on farms using two-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	2 R	1	4	21	.33	.16	.64
Flat break	2 disc	1	4	4	.11	.28	1.11
Harrow	2 section	1	4	19.5	.07	.04	.14
List	2R–16″ points	1	5	16.5	.26	.16	.80
Bed	2–20″ sweeps	1	5	15	1.01	.67	3.31
Center furrow	2 R lister	1	6	15	.11	.07	.44
Knife beds	2 R slide	1	4	17	.08	.05	.19
Cultivate beds	8 sweeps	1	4	17	.18	.11	.43
Plant	2–20″ sweeps	1	5	15	1.07	.71	3.51
Machine cultivation:							
Harrow	2 Section	1	2	21	.13	.06	.12
Knife	2 R slide	1	4	15	.14	.09	.37
Cultivate	8 sweeps	1	4	16	2.33	1.47	5.89
Hoe	----------	1	--	3	.75	2.64	----
Total hours per acre previous to harvest	----------	--	--	-----	-----	6.51	16.95
Harvest:							
Head and haul in	Wagon	1	2	----	1.00	4.50	9.00
Total all operations	----------	--	--	-----	-----	11.01	25.95

Table 49c. Labor and power required per acre for the usual operations in growing and harvesting milo on farms using two-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew			Acres per ten-hour day	Times over	Hours per acre		
		Man	Horse	Tractor			Man	Horse	Tractor
Seed bed preparation:									
Cut stalks	2 R	1	--	1	26	.33	.13	----	.13
Flat break	3 disc	1	--	1	7.5	.11	.15	----	.15
One-way	6 foot	1	--	1	18	.14	.08	----	.08
Harrow	4 section	1	--	1	75	.07	.01	----	.01
List	2 R	1	--	1	21	.26	.13	----	.13
Bed	2-20″ sweeps	1	--	1	20	1.01	.50	----	.50
Cultivate beds	2 R	1	--	1	24	.18	.08	----	.08
Plant	2-20″ sweeps	1	--	1	19.5	1.07	.55	----	.55
Machine cultivation:									
Harrow	4 section	1	--	1	63	.13	.02	----	.02
Knife	2 R slide	1	--	1	20	.14	.07	----	.07
Cultivate	3 R	1	--	1	27	2.33	.84	----	.84
Hoe	----------	1	--	--	3	.75	2.64	----	----
Total hours previous to harvest	----------	--	--	--	----	----	5.20	----	2.56
Harvest:									
Head and haul in	Wagon	1	2	--	----	1.00	4.50	9.00	----
Total all operations	----------	--	--	--	----	----	9.70	9.00	2.56

Table 49d. Labor and power required per acre for the usual operations in growing and harvesting milo on farms using three- and four-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew			Acres per ten-hour day	Times over	Hours per acre		
		Man	Horse	Tractor			Man	Horse	Tractor
Seed bed preparation:									
Cut stalks	4 R	1	--	1	55	.33	.06	----	.06
One-way	6 foot	1	--	1	18	.14	.08	----	.08
Harrow	4 section	1	--	1	75	.07	.01	----	.01
Bed	3-20″ sweeps	1	--	1	30	1.01	.33	----	.33
Plant	4-20″ sweeps	1	--	1	33	1.07	.32	----	.32
Machine cultivation:									
Cultivate	4 R	1	--	1	38	2.33	.61	----	.61
Hoe	----------	1	--	--	3	.75	2.64	----	----
Total hours previous to harvest	----------	--	--	--	----	----	4.05	----	1.41
Harvest:									
Head and haul in	Wagon	1	2	--	----	1.00	4.50	9.00	----
Total all operations	----------	--	--	--	----	----	8.55	9.00	1.41

Table 50a. Labor and power required per acre for the usual operations in growing and harvesting cane on farms using one-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	1 R	1	2	8.5	.27	.33	.65
Flat break	2 disc	1	4	4	.12	.30	1.22
List	1–14″ point	1	4	8	.21	.27	1.09
Bed	1–20″ sweep	1	2	8	1.22	1.50	3.01
Center furrow	Diamond point	1	2	9	.10	.11	.23
Cultivate beds	4 sweeps	1	2	9	.36	.39	.78
Plant	1–20″ sweep	1	2	7	1.02	1.47	2.94
Machine cultivation:							
Harrow	2 section	1	2	21	.07	.03	.07
Knife	1 R slide	1	2	8.5	.10	.12	.24
Cultivate	4 sweeps	1	2	8	2.07	2.59	5.20
Hoe	----------	1	--	4	.31	.82	----
Total hours per acre previous to harvest	----------	--	--	----	----	7.93	15.43
Harvest:							
Bind	1 R	1	3	7	1.00	1.42	4.27
Shock	----------	1	--	4.5	1.00	2.22	----
Haul and stack	Wagon	2	2	----	1.00	4.27	4.27
Total harvest	----------	--	--	----	----	7.91	8.54
Total all operations	----------	--	--	----	----	15.84	23.97

Table 50b. Labor and power required per acre for the usual operations in growing and harvesting cane on farms using two-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Cut stalks	2 R	1	4	21	.27	.13	.52
Flat break	2 disc	1	4	4	.12	.30	1.22
Harrow	2 section	1	4	19.5	.11	.06	.22
List	2R–16″ points	1	5	16.5	.21	.13	.64
Bed	2–20″ sweeps	1	5	15	1.22	.81	4.00
Center furrow	2 R lister	1	6	15	.10	.07	.40
Cultivate beds	8 sweeps	1	4	17	.36	.21	.85
Plant	2–20″ sweeps	1	5	15	1.02	.67	3.35
Machine cultivation:							
Harrow	2 section	1	2	21	.07	.03	.07
Knife	2 R slide	1	4	15	.10	.07	.26
Cultivate	8 sweeps	1	4	16	2.07	1.30	5.24
Hoe	----------	1	--	4	.31	.82	----
Total hours per acre previous to harvest	----------	--	--	----	----	4.60	16.77
Harvest:	1 R	1	3	7	1.00	1.42	4.27
Bind	----------	1	--	4.5	1.00	2.22	----
Shock	Wagon	2	2	----	1.00	4.27	4.27
Haul and stack							
Total harvest	----------	--	--	----	----	7.91	8.54
Total all operations	----------	--	--	----	----	12.51	25.31

Table 50c. Labor and power required per acre for the usual operations in growing and harvesting cane on farms using two-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew			Acres per ten-hour day	Times over	Hours per acre		
		Man	Horse	Tractor			Man	Horse	Tractor
Seed bed preparation:									
Cut stalks	2 R	1	--	1	26	.27	.10	----	.10
Flat break	3 disc	1	--	1	7.5	.12	.16	----	.16
One-way	6 foot	1	--	1	18	.14	.08	----	.08
List	2 R	1	--	1	21	.21	.10	----	.10
Bed	2–20″ sweeps	1	--	1	20	1.22	.61	----	.61
Center furrow	2 R	1	--	1	19.5	.10	.05	----	.05
Cultivate beds	2 R	1	--	1	24	.36	.15	----	.15
Plant	2–20″ sweeps	1	--	1	19.5	1.02	.52	----	.52
Machine cultivation:									
Harrow	4 section	1	--	1	63	.07	.01	----	.01
Knife	2 R slide	1	--	1	20	.10	.05	----	.05
Cultivate	2 R	1	--	1	19	2.07	1.10	----	1.10
Hoe	----------	1	--	--	4	.31	.82	----	----
Total hours previous to harvest	----------	--	--	--	----	----	3.75	----	2.93
Harvest:									
Bind	1 R	1	3	--	7	1.00	1.42	4.27	----
Shock	----------	1	--	--	4.5	1.00	2.22	----	----
Haul and stack	Wagon	2	2	--	----	1.00	4.27	4.27	----
Total harvest	----------	--	--	--	----	----	7.91	8.54	----
Total all operations	----------	--	--	--	----	----	11.66	8.54	2.93

Table 50d. Labor and power required per acre for the u sual operations in growing and harvesting cane on farms using three- and four-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew			Acres per ten-hour day	Times over	Hours per acre		
		Man	Horse	Tractor			Man	Horse	Tractor
Seed bed preparation:									
Cut stalks	4 R	1	--	1	55	.27	.05	----	.05
One-way	6 foot	1	--	1	18	.14	.08	----	.08
Harrow	4 section	1	--	1	75	.11	.01	----	.01
Bed	3–20″ sweeps	1	--	1	30	1.22	.40	----	.40
Cultivate beds	4 R	1	--	1	35	.36	.10	----	.10
Plant	4–20″ sweeps	1	--	1	33	1.02	.31	----	.31
Machine cultivation:									
Cultivate	4 R	1	--	1	36	2.07	.58	----	.58
Hoe	----------	1	--	--	4	.31	.82	----	----
Total hours previous to harvest	----------	--	--	--	----	----	2.35	----	1.53
Harvest:									
Bind	1 R	1	3	--	7	1.00	1.42	4.27	----
Shock	----------	1	--	--	4.5	1.00	2.22	----	----
Haul and stack	Wagon	2	2	--	----	1.00	4.27	4.27	----
Total harvest	----------	--	--	--	----	----	7.91	8.54	----
Total all operations	----------	--	--	--	----	----	10.26	8.54	1.53

Table 51a. Labor and power required per acre for the usual operations in growing and harvesting small grain on farms using horse-drawn equipment

Operations	Size or type of tool	Unit crew			Acres per ten-hour day	Times over	Hours per acre		
		Man	Horse	Tractor			Man	Horse	Tractor
Land preparation:									
Flat break	2 disc	1	4	--	4	.66	1.67	6.69	----
Harrow	2 section	1	4	--	19.5	.21	.11	.43	----
Drill	6 foot	1	4	--	13.5	1.00	.74	2.95	----
Total hours previous to harvest	----------	--	--	--	----	----	2.52	10.07	----
Harvest:									
Bind	6 foot	1	4	--	15	1.00	.66	2.63	----
Shock	----------	1	--	--	7.5	1.00	1.32	----	----
Thresh	Thresher	11	16	1	----	1.00	3.24	5.01	.31
Haul	Wagon	1	2	--	----	1.00	.45	.90	----
Total harvest	----------	--	--	--	----	----	5.67	8.54	.31
Total all operations	----------	--	--	--	----	----	8.19	18.61	.31

Table 51b. Labor and power required per acre for the usual operations in growing and harvesting small grain on farms using tractor-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Tractor			Man	Tractor
Land prepration:							
Flat break	3 disc	1	1	7.5	.66	.88	.88
One-way	6 foot	1	1	18	.26	.14	.14
Harrow	4 section	1	1	75	.21	.03	.03
Drill	8 foot	1	1	21	1.00	.48	.48
Total hours per acre previous to harvest	----------	--	--	----	----	1.53	1.53
Harvest:							
Combine	(Contract)	2	1	26.5	1.00	.76	.38
Haul	Trailer	1	1	----	1.00	.35	.35
Total harvest	----------	--	--	----	----	1.11	.73
Total all operations	----------	--	--	----	----	2.64	2.26

Table 52a. Labor and power required per acre for the usual operations in growing sudan for pasture on farms using two-row horse-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Horse			Man	Horse
Seed bed preparation:							
Flat break	2 disc	1	4	4	.23	.58	2.33
Bed	2 R	1	5	16	1.50	.93	4.62
Cultivate beds	2 R	1	4	17	.09	.05	.21
Plant	2–20″ sweeps	1	5	15	1.00	.66	3.28
Cultivate	2 R	1	4	16	1.91	1.20	4.83
Total all operations	----------	--	--	----	----	3.42	15.27

Table 52b. Labor and power required per acre for the usual operations in growing sudan for pasture on farms using two-row tractor-drawn equipment

Operations	Size or type of tool	Unit crew		Acres per ten-hour day	Times over	Hours per acre	
		Man	Tractor			Man	Tractor
Seed bed preparation:							
Flat break	3 disc	1	1	7.5	.25	.33	.33
One-way	6 foot	1	1	18	.19	.10	.10
Bed	2–20″ sweeps	1	1	21	1.44	.71	.71
Cultivate beds	2 R	1	1	24	.06	.03	.03
Plant	2–20″ sweeps	1	1	19.5	1.00	.51	.51
Cultivate	2 R	1	1	19	1.88	1.00	1.00
Total all operations	----------	--	--	----	---	2.68	2.68